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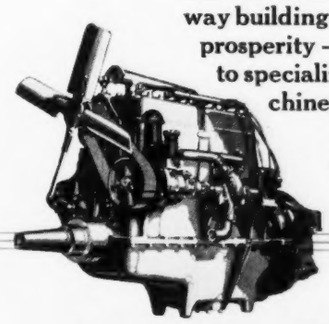

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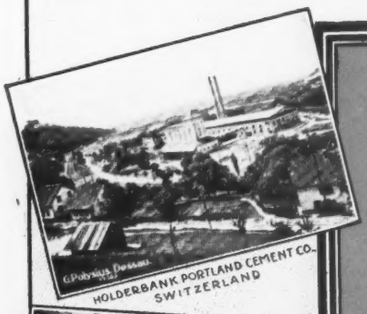
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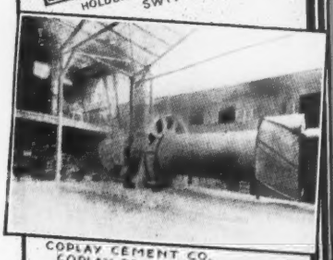
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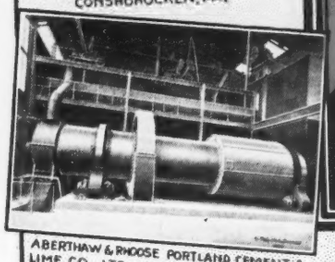
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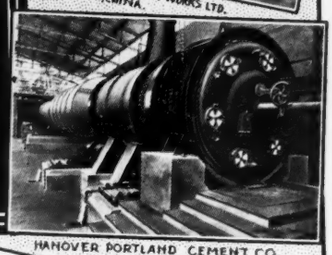
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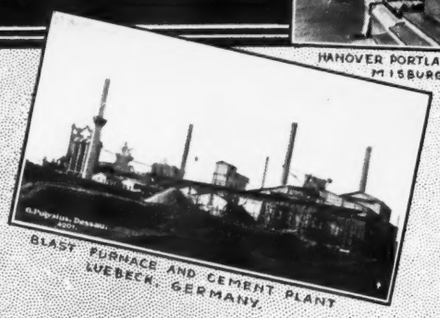
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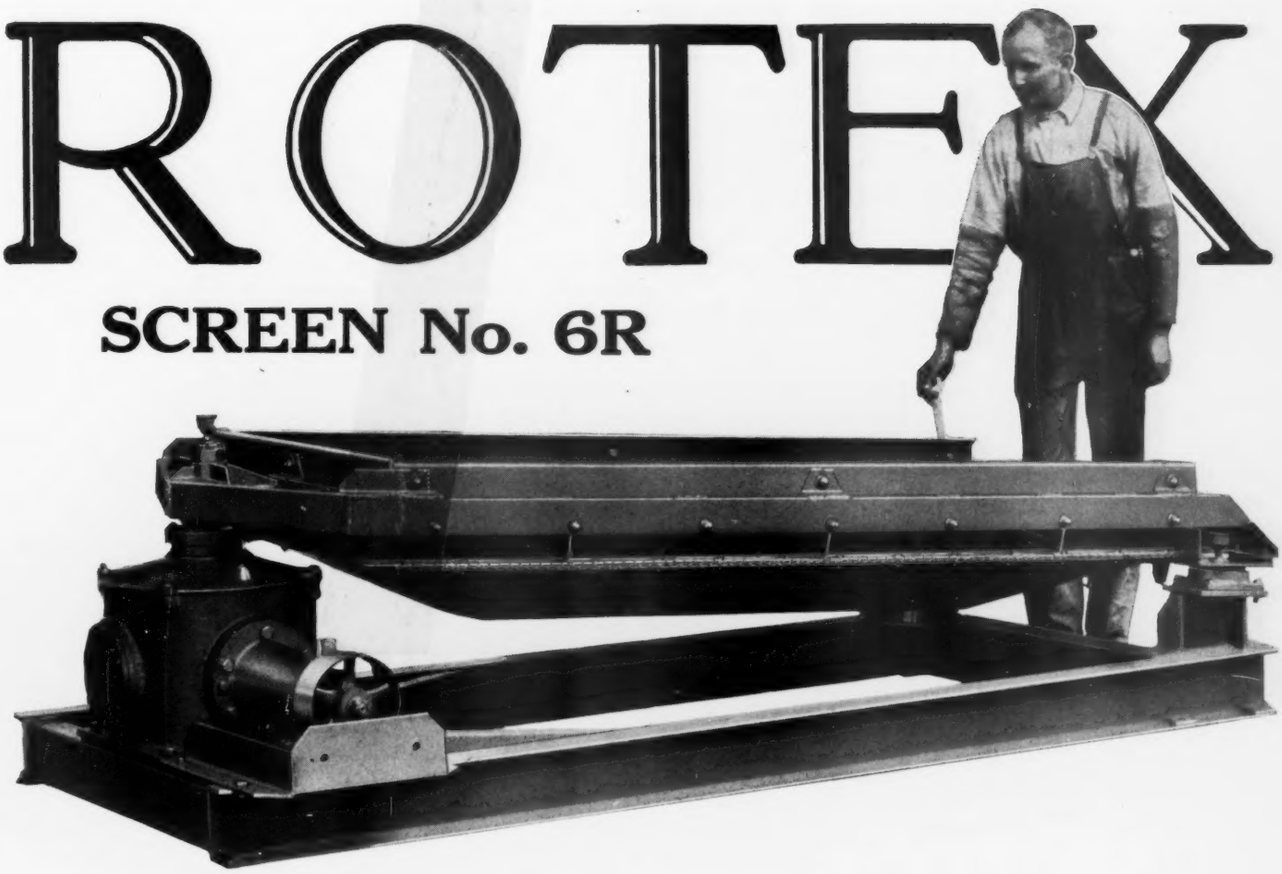

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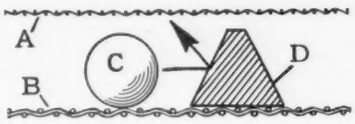

A—Screening mesh.
B—Coarser ball supporting screen.
C—The balls flying about, due to the gyrating action of the screen box, strike the inclined surface D and are deflected upward, hitting the under side of the screening mesh.

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CEMENT and ENGINEERING NEWS

Volume XXXII | Chicago, January 19, 1929 | No. 2

Aeroplane view of the Superior Portland Cement, Inc., plant and city of Concrete, Wash. The snow-covered mountain peak in the upper left-hand corner is Mt. Shuksan and the lake is Lake Shannon, a reservoir made by damming the Baker River. The limestone quarry is near the center of the picture. An aerial tramway brings the stone to the plant, where a storage pile of limestone is in evidence (lower left-hand corner). Probably no cement mill in the world has a more beautiful setting than this; and visitors are always extended a cordial welcome. A news item detailing the annual December safety rally of the Superior Cement company will be found in the news section of this issue. With the above view of the city of Concrete in mind, one may readily understand the part of the company in the community life, and its pride and pleasure in contributing to community welfare

The Feldspar Industry in Pennsylvania

Twenty Years Ago State Held Second Rank as Feldspar Producer—Small Operations and Hand Labor Methods Reduce State to Eighth

By R. W. Stone
Pennsylvania Geological Survey, Harrisburg, Penn.

AN INDUSTRY that amounted to one-sixth as much last year as 20 years ago would hardly seem fit to describe in an up-and-coming journal like ROCK PRODUCTS, but as all the more important feldspar producers are on its subscription list, they ought to have an article on feldspar once in a while. Furthermore I believe that the feldspar industry in Pennsylvania may only be napping because consumers are at present paying too little to make quarrying profitable; when the price goes up production will increase, for the known deposits are not all exhausted and it is possible that others may yet be found.

The latest report on the subject is U. S. Bureau of Mines Bulletin 92, "The Feldspars of the New England and North Appalachian States," by A. S. Watts, published in 1916. Because the Pennsylvania Geological Survey is interested in the further development of the mineral resources of the commonwealth I visited the deposits in September, 1927. This article is based on notes made at that time.

Varieties of Feldspar

Feldspar, or spar as the miners call it, is a general name for a group of abundant rock-forming minerals. They are aluminosilicates of potassium, sodium, calcium and rarely barium. Only four of the varieties are of commercial importance, microcline, orthoclase, albite and anorthite.

Uses—Feldspar is produced in the United States largely in Maine, New York, Maryland and North Carolina and used in the manufacture of pottery, enamel ware, enamel brick and electrical porcelain. The consumption in the United States is divided about as follows:

	Per cent
Ceramic industries	84.0
Roofing and cement surfacing	6.0
Cement manufacture	5.0
Scouring soaps and abrasives	2.5
Binder for abrasive wheels, etc.	2.0
Poultry grit	0.5
	100.0

In the ceramic industry the greatest use is as a constituent part of both body and glaze in true porcelains, white ware and vitrified sanitary ware, and as a constituent of the slip (under glaze) and glaze in so-called porcelain sanitary ware and enamel brick. In the body of vitrified wares feldspar ranges from 10 to 35%. It serves as a flux to bind the particles of clay and quartz together. Glazes contain 30 to 50% of feldspar.

For use in making pottery it is required that feldspar be nearly free from any mineral that will not burn white; especially must it be free from iron-bearing minerals (biotite, hornblende, tourmaline, garnet, etc.).

R. W. Stone

Enamels applied to metals are fused with feldspar. Our modern gleaming white bathtubs and wash bowls are usually made of cast iron to which while still hot is applied an enamel containing much feldspar. It may enter into the manufacture of plate, window and bottle glass as a source of alumina and of the alkalies, and with fluorspar is commonly used in opalescent glass.

Crushed spar is used in considerable quantity in the form of granules on roofing material and also in the facing on cement blocks particularly on those designed to resemble granite. For this purpose the feldspar of course need not be high grade; in fact a pegmatite from which the spar cannot be separated economically may be used for this purpose. Poultry grit is another use and outlet for low grade spar. It need only be crushed and screened to the size suitable to be attractive to poultry, one size for mature fowls and a smaller size for chicks.

Scouring soaps and abrasives made of feldspar differ from those made of quartz and other minerals in the degree of hardness of the individual grains. Feldspar is slightly softer than glass and so less likely to scratch windows or glassware than soaps in which quartz or other harder mineral is the abrasive substance.

A small quantity of feldspar is used annually for making carborundum, corundum, emory and other abrasive wheels. The feldspar fuses and on cooling binds the abrasive grains together.

Geology of Feldspar

Geologic Occurrence—Although feldspar is a principal constituent of igneous rocks, it is rarely in sufficiently large crystals or readily separable from other minerals to be of commercial importance. In some granitic rocks feldspar is 60% of the mineral aggregate, but the grains are so small and so intimately mixed with other minerals that the rock has no value as a source of feldspar. The common source of feldspar is pegmatites—igneous rocks of very coarse and irregular texture. These rocks vary widely in mineral composition, but only two types yield spar of commercial importance: (1) the granite pegmatites, which are the same as granite except that the grains are very much larger, and (2) the soda pegmatites, which consist of soda feldspar (albite) and a small quantity of hornblende, but contain no quartz or tourmaline. Most feldspar quarries are in granite pegmatite, but a very few in Pennsylvania and Maryland are in soda pegmatite.

Pegmatites are closely related to granite in origin and were forced into the inclosing rocks in a fluid condition. They penetrated cracks or opened and filled lines of weakness and therefore are irregular in shape and usually very lenticular. These intruded masses are known as dikes and sills, depending on whether their position is more nearly vertical or horizontal. A dike or sill may have considerable length but pinch and swell

*Katz, F. J., Feldspar: U. S. Geol. Survey Mineral Resources 1917, p. 141, 1920.

along its course. For instance, a pegmatite dike may be 1000 ft. long and not more than 2 or 3 ft. wide throughout much of its length, but swell at a few places to 50 ft. or more.

Pegmatite dikes and sills vary widely in character. The rock may be of a comparatively uniform texture throughout, or it may consist of a number of distinct and separate bands of widely differing composition. In the first cases the dike represents a single fluid or molten intrusion, but a banded dike indicates several distinct periods of solidification. The contact with the inclosing walls may be indistinct, as if the dike had been intruded before the walls were completely solidified, or as if the intruded material had slightly melted and blended with the wall rock; or the contact may be very sharp and distinct.

If the crystallization is very coarse or the dike consists of distinct bands, feldspar may be obtained in commercial quantity quite free from other minerals. In most dikes, however, feldspar and quartz are intimately intergrown, and fairly pure spar can be obtained only by careful elimination of such associated minerals as occur in lumps.

Not only are pegmatite dikes very irregular in shape, as is to be expected of a mass intruded under varying pressure into rock differing in density and kind, but also the structure of a dike is variable. Coarsely crystalline pegmatite almost exclusively feldspar and quartz may change abruptly to a finely crystalline rock containing several other minerals which render it valueless as a source of commercial feldspar. In the larger bodies of pegmatite may be found large bodies or horses of the wall rock, which must be omitted in mining or discarded. A pegmatite dike may be remarkably clean or free from impurities in the upper part and change at a depth of 15 ft. or so to granite carrying biotite and hornblende, or the cap of a dike may be valueless for commercial feldspar but at a depth of 2 or 3 ft. under the surface may be excellent material. Also a dike may be many feet wide but composed of different bands, some of clean feldspar, some almost wholly of quartz and some heavily charged with mica. In this case only a small portion, two or three narrow bands out of the whole width, may be worth mining for spar.

As pegmatite is generally conceded to come from the subterranean mass of molten material which on cooling formed granite, so it is natural that most pegmatite dikes are in granite or granitic rocks. The crevices, however, into which the pegmatite was intruded may extend beyond the granite mass into other kinds of rock.

Feldspar deposits of the granitic type are essentially coarsely crystalline mixtures of feldspar and quartz, but the associated minerals other than quartz are important, as their amount and mode of occurrence influence greatly the value of the pegmatite. The minerals commonly associated with feldspar are quartz, muscovite, biotite, tourmaline, garnet and beryl.

As the common source of feldspar is pegmatites or graphic granite and these are found in granitic rocks, it follows that the feldspar deposits of Pennsylvania are confined to the southeastern part of the state.

Mining—Practically all production of feldspar in Pennsylvania has been by simple open pit methods. In only two localities (Brandywine Summit and Chatham) was underground mining done by drifts; a prospect drift is reported as having been driven in the pegmatite dike at Avondale.

Simple pits sunk on the outcrops, or cuts made along a dike, will describe most of the developments. In a few places work has continued until a hole has been made 100 yd. long and so deep that derricks were required for hoisting.

In Pennsylvania and Maryland, unlike New York and the New England states, the feldspar localities are unglaciated and the surface exposures are deeply weathered. This permits excavation with pick and shovel, and in most of the deposits this is the only method that has been used.

In 1927 the quarry south of Embreeville was worked by sinking vertical drill holes behind the face and blowing it down, as in quarrying for crushed stone. The larger lumps are then broken by sledge or by dynamite. The ore is loaded by hand into quarry cars and run out on top of the wsate pile. Here the material is sorted; waste goes over the dump and the ore is piled near the edge. Here the ore is broken with a light sledge or hammer to remove the waste and sort out the marketable spar. The sorted spar is piled on the leveled top of the waste dump where it is exposed to the weather and cleaned by rain until a carload has accumulated.

At the quarry at Baker Station the rock is brought down by pick and bar, mauled when necessary, and loaded on a wheelbarrow, by which it is removed to a stockpile

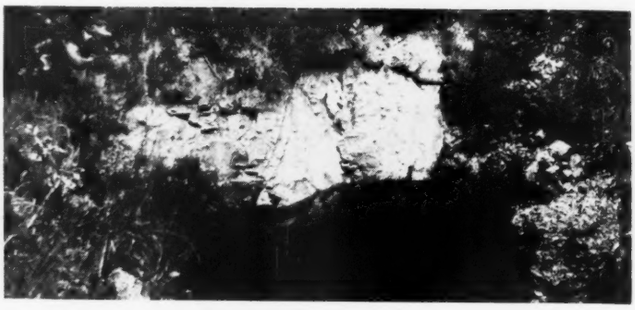
Worked out feldspar dike, Chester county, Pennsylvania

Outcrop of feldspar dike in abondoned pit

Old millstones made of coarse quartzose sandstone

Open pit working near Nottingham, Penn.

Waste pile at Sporvetta feldspar mine



Pit near Baker Station; the dike is about 40 ft. wide

on the quarry floor. Little sorting is done because most of the rock is second grade spar, and that not fit for grinding is left in place.

Milling and Preparation

Milling — The one grinding mill is at Toughkenamon, alongside the Maryland division of the Pennsylvania railroad. Spar brought to the mill by truck is stored under a shed until needed. It is ground in a stone chaser mill, from which it goes to three tube mills. According to Robert R. Jacobs, who runs the mill, the spar is pulverized until 85% will pass a 325-mess screen. The finished product is sacked and shipped for use in pottery and enamel ware.

A chaser mill consists of two buhrstone wheels about 3 to 5 ft. in diameter and 12 to 18 in. thick, attached to each other by a horizontal axis, as are the wheels of a cart. The horizontal axis is attached at its middle to a vertical rotating shaft, which causes the buhrstone wheels to travel over a buhrstone bed, the feldspar being crushed between the wheels and the bed. The material as it comes from the chasers is screened, the tailings being returned to the chaser mill for recrushing, while the fines go to the tube mills for their final grinding. The tube mills consist of steel cylinders revolving on a horizontal axis. They are usually lined either with hard wood blocks or with blocks made of natural or artificial siliceous bricks, and are charged with flint pebbles 2 to 3 in. in diameter.

The Sparvetta grinding plant near Nottingham had three 7-ft. buhrstones set flat on the ground on masonry foundations, and the chasers were 5 ft. in diameter. These stones, still at the mine, are coarse quartzose sandstone with quartz pebbles, ranging in size up to half an inch or more.

The grinding mill at the Brandywine Summit mine was burned about 1920.

Production

According to the U. S. Geological Survey, which began to get fairly complete figures of feldspar production about 1900, the output in Pennsylvania in the first 20 years of this century was about 265,000 tons, and brought the producers and local grinding mills over $1,990,000. The average annual production in those years was about 13,000 tons, and the annual income about $100,000.

Since 1920 the industry has decreased. Some present and former producers say that with the present high cost of unskilled quarry labor there is no profit in mining feldspar at present prices. The writer believes that this mineral resource is not exhausted, that some of the deposits still contain as much unmined spar as has been taken from them; that other commercial bodies of spar remain undiscovered in this same region, and that a natural resource capable of yielding $100,000 annually to a few small communities is worthy of further consideration.

Figures in "Mineral Resources of the United States," giving the annual production of crude and of ground or refined feldspar, show that the average price for crude spar was a little over $3 a ton for many years, but fell to $2.50 in 1915 ad rose to $9.47 in 1920. In 1925 it was $3.55.

In 1907 Pennsylvania ranked second among the states for quantity of crude feldspar produced. In 1917 her product was sixth in quantity and fourth in value. In 1925 (the latest year for which figures are available at the time of writing) Pennsylvania held eighth place with an output of 1330 tons, as against 76,806 tons for North Carolina and 185,706 tons for the United States. Her output therefore is less than 1% of the country's output.

In 1917 the prices for Pennsylvania crude ranged from $2 for grits to $6 for the better grades of pottery spar, with the average price well over $5. Ground spar sold from $7.20 to $12 and averaged $10.25. In 1925 the average value of all crude spar produced in Pennsylvania was $3.55 a ton, or $3 less per ton than the average value in Connecticut, New York and North Carolina, and as compared with $9.04 for Maine and $7.08 for the United States.

Grinding adds much to the value. The average value of ground domestic feldspar at the mill in recent years has been between $16 and $17. In 1925 Tennessee sold one-third of the country's output of ground spar at an average of $12.95 per ton, New Jersey 21% at $19.41 and Maine 14% at $18.76. Pennsylvania's figures cannot be published without revealing individual mill production.

Description of Deposits

Most of the feldspar deposits are near the Pennsylvania-Delaware line. I visited all that have been described by other writers and several deposits not previously described. They number about 25, of which 20 are in

PROPERTIES OF PENNSYLVANIA FELDSPAR IN STANDARD PORCELAIN MIXTURE*
(D. J. Demorest, Ohio State University, Columbus, Ohio, analyst)

Location	Feldspar	Fuses at deg. C.	Warping at 1330 deg. C.	—Fired at 1330 deg. C.— Color	Translu-cency	Shrink-age
Darlington	Microcline	1290	none	cream-white	0.87	13.4
Chester Heights	Microcline	1300	none	cream	0.86	11.8
Chester Heights	Albite	1300	slight	cream	0.79	10.4
Boothwyn	Albite-pegmatite	1310	none	cream	0.77	12.6
Boothwyn	Microcline	1300	none	cream	0.79	12.4
Brandywine Summit	Microcline-albite	1310	none	cream	0.80	12.0
Mendenhall	Microcline	1300	none	cream-white	0.80	12.8
Mendenhall	Albite-pegmatite	1310	slight	cream	0.80	11.8
Embreeville	Albite-pegmatite	1290	slight	cream	0.78	12.2
New Garden	Graphic granite	1300	none	cream-white	0.78	11.8
Pomeroy	Graphic granite	1290	none	light-cream	0.84	11.6
Chatham	Microcline	1310	none	cream	0.79	12.6
Carpenter	Microcline-pegmatite	1290	none	cream	0.75	11.0
Hicks	Pegmatite	1290	none	.....	0.59	11.2
Baker Station	Microcline-albite	1280	distinct	cream	0.74	11.6
Cooper	Microcline-pegmatite	1290	none	cream	0.72	12.0
Sylmar, Brandywine	Albite	1280	slight	cream-white	0.82	12.0

*U. S. Bur. of Mines, Bull. 92.

ANALYSES OF PENNSYLVANIA FELDSPARS AND PEGMATITES*
(D. J. Demorest, Ohio State University, Columbus, Ohio, analyst)

	Deposit		Composition							
Character of sample	Town or place	County	Ignition loss	SiO_2	Al_2O_3	Fe_2O_3	CaO	K_2O	Na_2O	Total
Microcline	Darlington	Delaware	0.12	64.70	19.60	0.03	0.05	11.87	3.76	100.13
Microcline pegmatic	Chester Heights	Delaware	0.33	73.35	14.60	0.06	0.06	9.11	2.00	99.51
Albite pegmatite	Chester Heights	Delaware	0.42	74.60	15.66	0.05	2.75	0.65	6.33	100.46
Buff Microcline	Mendenhall	Chester	0.21	64.36	20.01	0.20	0.46	12.44	2.48	100.16
Albite pegmatite	Mendenhall	Chester	0.60	67.93	20.49	0.30	2.60	0.80	6.95	99.67
Graphic granite	New Garden	Chester	0.30	72.39	15.57	0.20	0.13	9.55	2.27	100.41
Graphic granite	Pomeroy	Chester	0.24	67.87	17.82	0.15	0.12	10.93	3.33	100.46
Albite	Sylmar	Chester	0.83	67.47	20.05	0.15	0.24	0.86	9.74	99.34

*U. S. Bur. of Mines, Bull. 92, p. 96, 1916.

Chester county and the others in Delaware county. This brief description will proceed from west to east.

Chester County

Nottingham—In the extreme southwest corner of Chester county and between two and three miles southwest of Nottingham in an area known as "The Barrens" is a group of feldspar deposits that has been worked for many years and still is producing spar in a small way. The principal operations were concluded 25 or 30 years ago and the open pits of the Sparvetta, Keystone and Brandywine deposits are now full of water. These pits are 150x300 ft. and 80 ft. deep. The ore here is a soda pegmatite, the principal minerals being soda feldspar (albite) and hornblende. The country rock is serpentine.

Many smaller openings have been made here on other veins. Shipments of spar from this locality made in recent years by Harry Rhodewalt have been obtained by working over the old waste heaps and by prospecting. It is No. 2 spar and some shipments to a linoleum factory have included much chalcedony. Mr. Rhodewalt is prospecting his tract and has a fair chance of uncovering a commercial deposit.

Avondale—Within a radius of three miles from Avondale spar has been mined at eight localities. In these deposits the potash feldspar, microcline, is the principal spar. The commercial operations were on the Monahan, Cooper, Jenkins, Carpenter, Thompson and Hicks farms, at Chatham and at Baker Station. Twenty-five or 30 years ago one of these is said to have produced a hundred tons a week from a weathered pegmatite dike. Operations on the Carpenter farm were more extensive than the others and included an 80-ft. shaft with hoisting engine, besides large and small pits. Large quantities of No. 1 spar were shipped, and hand selected crystals of microline were barreled and sold for dental spar. Operations ceased 20 years ago, but the dumps still yield an occasional load of mixed spar and quartz for dressing private roads and paths.

In all this group the one at Baker Station alone is being worked now. A pegmatite dike about 40 ft. wide and much decomposed is dug with hand tools by one to three men employed by R. R. Jacobs. The rock is sorted in the pit and the product, No. 2 grade, is trucked to Jacobs' mill at Toughkenamon, and ground 85% through 320-mesh.

As most of the pits at these localities have been idle many years they are now washed in and overgrown, but specimens of the spar can be found on the dumps. The country rock is mica schist and gneiss.

Embreeville—A pit 75 ft. in diameter and 40 ft. deep is all that remain of an operation begun near the railroad station at Embreeville in 1885 and stopped in 1910. There is said to have been plenty of spar in the bottom of the pit when work was discontinued because of water. The vein was about 10 ft. wide in mica schist.

One mile south of Embreeville is a quarry from which the Standard Flint and Spar Corp. of Trenton, N. J., produced in 1926-27 by far the largest part of Pennsylvania's feldspar output in those years. Under the superintendence of A. E. Buzzo the quarry has been enlarged to 75 ft. in diameter with a vertical face 35 ft. high, all in spar. Six men were employed and the shipments last year were about 35 cars, all used for pottery and glaze on sanitary ware. This deposit is composed of a gray spar with a considerable admixture of yellow muscovite. The spar is unlike that at any other deposit in Pennsylvania and whether it is albite or microcline has not yet been determined. According to producers it has the composition:

ANALYSIS OF FELDSPAR FROM FAZIO QUARRY, EMBREEVILLE

	Per cent
Silica	72.03
Alumina	15.71
Ferric oxide	0.13
Calcium	1.10
Magnesium	none
Sodium	3.03
Potassium	7.59
Loss on ignition	0.32

Mendenhall—Five miles east of Kennett Square and one mile east of Mendenhall on the Albert Walker farm two sizable quarries, one 80x120 ft. and 50 feet deep, the other 40x100 ft. and 35 ft. deep, have been opened on a pegmatite dike about 25 ft. wide that carries both microcline and albite. Large lumps of clear microcline or dental spar can be obtained here and it is apparent that the deposit of coarse soda and potash pegmatite is not exhausted. Mr. Walter states that he stopped quarrying a few years ago because of the high cost of labor and low price of spar.

On the Rigby farm at Mendenhall is a small pit from which several cars of mixed spar have been shipped in recent years.

Coatesville—A spar deposit opened on the Boyle farm about 15 years ago was worked in 1926 by the Standard Flint and Spar Corp. of Trenton but discontinued because the spar is too high in iron to be suitable for their trade.

Three miles west of Coatesville the Helen A. Meredith Co., Inc., of Coatesville, is digging spar in a circular quarry about 200 ft. in diameter. At the surface the dike is fine-grained graphic granite with flesh-colored microcline and colorless transparent quartz. At depth the feldspar is pale cream

Feldspar dike in abandoned pit at Elam, Delaware county, Pennsylvania

Pit at Elam showing spar and kaolin above water level. Mass of spar at left center agruptly terminating at dark schist

Close view showing typical angular fracture of feldspar

or nearly white and in large crystals. The product of the quarry is crushed and screened in a mill on the property and sold as poultry grit. Finely pulverized spar is made into a cleaning compound.

Delaware County

Brandywine Summit—In the southwest corner of Delaware county at Elam a former considerable industry is now marked by about four acres of deep pits. Mining began here about 1883 with the production of kaolin. As the pits deepened unweathered feldspar of good quality was found and feldspar mining continued to a depth of 200 ft. The potash feldspars, orthoclase and microcline, were found here in pure crystals ranging up to a foot in diameter. This operation was by the Brandywine Summit Feldspar and Kaolin Co. The spar was ground at the company's mill near by, together with soda spar from pits operated by the company near Nottingham, Chester county. Most of the spar was sold for the manufacture of pottery, but especially fine specimens were sold by the barrel to manufacturers of artificial teeth.

Since the mill burned about 1920 all operation has ceased here and the branch railroad spur has been taken up. Since 1920 D. J. Haley of Elam has made occasional shipments of selected spar from these pits to manufacturers of false teeth. Several tons of sacked spar are on hand. Exposures of the dike in the walls of these large pits indicate that the spar is not exhausted.

Boothwyn—Two miles west of Marcus Hook on the Boudwin farm at Boothwyn a prospector would find plenty of float. Large lumps of pink feldspar were used as building stone in the walls of the barn and in a small dam, and fragments of spar are abundant in the plowed fields. Hundreds of tons of spar were quarried on this farm years ago. The dike in the quarry now filled with water is said to be nearly 40 ft. wide. Graphic granite is abundant and the spar is dark buff microcline. A prospect pit in another field uncovers a vertical dike of pegmatite and spar 11 ft. wide. The spar is microcline and perthite, with some orthoclase. The wall rocks are black schist.

Surface indications suggest the possibility of a commercial deposit here and it would seem worthy of further prospecting when the prices justify a larger production of Pennsylvania spar. This farm adjoins a railroad station.

Other Deposits—Feldspar has been produced at several other places in Delaware county, including Twin Oaks, Boothwyn, Chester Heights and Darling, but these have all been idle for several years, some for many years.

North State Feldspar Corp. Practices Economy in Grinding Feldspar

By R. Carl Moore
Micaville, N. C.

THE NORTH STATE FELDSPAR CORP., of Micaville, N. C., was one of the pioneers in the development of the North Carolina feldspar industry and is now the oldest organization in the state engaged in the actual grinding of feldspar. Its compact grinding unit operates with a minimum of overhead, and its mines are all located within easy hauling distance of the plant. A considerable amount of spar is purchased also, although much of this is not mined by up-to-date methods and the supply varies with the weather conditions, especially in winter.

The most important mine of this corporation is the Goog Rock mine, located along the South Toe river two miles below the plant. The mining methods pursued here are in general typical of the other mining operations of the company. The feldspar here occurs in a narrow vein about 15 ft. in width running parallel with the mountain, and has been worked to a depth of 80 ft. The rock is drilled in benches with Ingersoll-Rand jackhammers driven by an electrically operated Ingersoll-Rand air compressor, and after being shot down is carefully cobbed to eliminate any undesirable portions. It is then hauled by trams to one end of the mine. Here the material is lifted by means of a derrick operated by an electrically driven Clyde hoisting engine and placed in a tipple. From this tipple an aerial cableway, operated by gravity, conveys it across the river to a storage bin on the op-

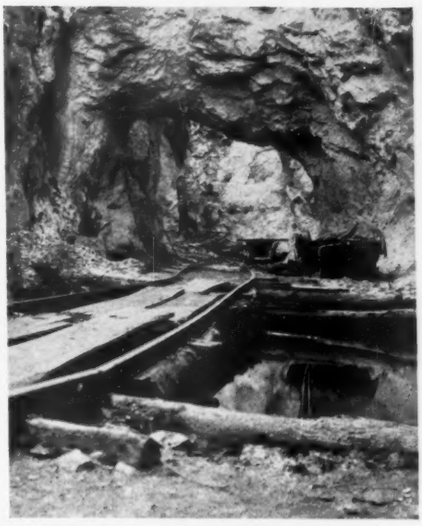
The Presnell mine

General view of the Goog rock mine

General view of the North State Feldspar Corp. plant at Micaville, N. C.

posite side along the Black Mountain railroad. This bin empties directly into railroad cars. The feldspar produced in this mine is of exceptional purity. The Presnell mine, two miles farther down the river, is operated in a similar manner, except that no hoist is required at that point.

The finishing plant, located a mile above Micaville, N. C., is equipped with a side track at the rear devoted exclusively to the unloading of cars containing raw material, while an entrance at the front permits truck and wagon deliveries to the storage sheds. The storage sheds are divided into compartments, each designed to receive a spar of a certain analysis or property. Careful analyses and tests are made of the spar produced by every mine whose product enters the plant, whether operated by the company or by others, and these findings are checked frequently. In this way the properties of the spar in each compartment is at all times known, and the company is prepared at any time to meet any analysis or fusion test specified by a customer, either by straight grinding from one mine or by a blended product, as the case may be. In addition to these precautions, tests are made in the laboratory on samples of spar ground during each of the three eight-hour shifts into which the working day is divided.



Interior of the Goog mine

Storage sheds, North State Feldspar Corp.

Rear view of the storage sheds

Interior of the storage shed

The feldspar is conveyed in wheelbarrows from the crude storage compartments to the mouth of a Reliance jaw crusher. Here it is reduced to pieces ½ in. in size and smaller and delivered to bucket elevators which elevate it to an overhead bin. From this bin it is fed by mechanical feeders into Hardinge conical pebble mills equipped with Allis-Chalmers Texrope drives. These mills pulverize the feldspar to the desired mesh of fineness. Steel incased bucket elevators then lift the finer meshes to a Gayco air separator, and the coarser meshes to a Hum-mer screen. After the final sizing, the finished material is stored either in large storage bins or is run through the bagger and the bags of material stored in a warehouse adjacent to the side track. The bulk storage bins overlook the side track and the finished material flows through chutes directly from these bins into railroad cars.

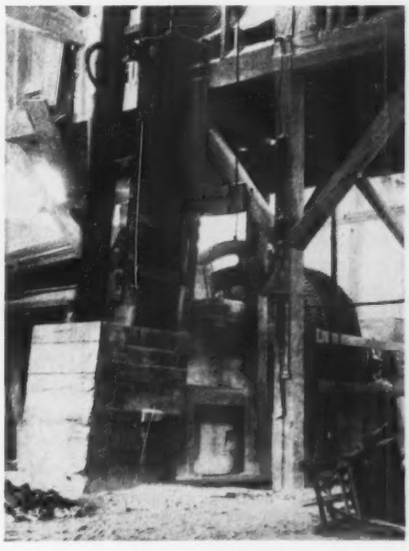
The entire plant is operated by electric motors supplied with power by a public utilities company. The company formerly operated its own power plant but during the summer of 1928 switched to purchased power. The capacity of the mill ranges up to 140 tons of finished material per day.

The executive officers of the company are: W. F. Deneen, President and General Manager; A. M. Kistler, Secretary.

Illinois Coal Producers Make Unique Request

CEMENT MILLS that do not use Illinois coal have received awards for more than 1,000,000 bbl. of cement to be used in the 1928 road-building program of the state is the protest sent to the Illinois State Department of Public Works and Buildings by the Illinois Coal Sales Association of East St. Louis. Much of the cement, it is charged, has been ordered from mills in the Kansas natural gas belt.

"Figuring 200 lb. of coal to 1 bbl. of cement," said Edward A. Wieck, secretary-manager of the association, "the coal industry of the state stands to lose business amounting to 115,000 tons from orders placed with mills that do not use our coal. The tax burden of the people can be lightened considerably if the money for highway construction is spent within the state where possible."—*St. Louis* (Mo.) *Globe-Democrat.*



Part of the mill room

Flue Dust—Is It Detrimental to Portland Cement?

Results of Observations at Several Plants

By Alton J. Blank

Formerly Chief Chemist, La Tolteca Cia. de Cemento Portland, S. A., Tolteca, Now General Superintendent and Supervising Chemist, Compania de Cimento Portland Lando, Puebla, Puebla, Mexico

THE AMOUNT OF RAW MIX required to produce a barrel of portland cement clinker (376 lb.) will vary from one cement plant to the other. The factors affecting this figure in the dry process of manufacture may be stated as follows: Diameter and length of kiln; draft carried on kiln; design of kiln dust chamber; operating on natural draft, or in connection with waste-heat boilers.

Where cement plants employ small kilns it is to be expected that the dust loss will be greater than in cement plants employing large kilns.

The loss in dust from kilns carrying a very high draft would be greater than from those kilns carrying comparatively low drafts.

The dust loss from kilns which have the ordinary dust chamber in use would probably be greater than from kilns which have specially designed dust chambers, and the dust loss from kilns operating on natural draft would be expected to be greater than from kilns operating in connection with waste-heat boilers.

Actual Dust Losses

Several years ago the writer had occasion to take part in an experiment carried out to determine the dust loss from 10x150-ft. kilns, to which were attached dust chambers of special design, which approximated 40 ft. in length. These dust chambers were found to reclaim enormous quantities of dust daily, and it was supposed that the loss in dust as carried out through the stack was negligible.

Experiments proved that notwithstanding the dust collecting efficiency of the special type dust chambers, the loss in dust through the stack exceeded 4.0% of the total amount of raw mix fed to the kilns.

Shortly afterwards the writer took part in an experiment made to determine the dust loss from 10x175-ft. kilns employing the wet process of manufacture. At this plant the loss in dust carried out by the waste kiln gases exceeded 3.5% of the total amount of raw mix fed to the kilns.

In a smaller cement plant using 8x125-ft. kilns, dry process, behind which the ordinary type of dust chamber was in use, the writer had reason to believe, in view of the large amount of raw mix required for each barrel of clinker produced, that the loss in dust as carried out of the stack by the waste gases exceeded 10.0% of the total raw mix fed to the kilns.

In another cement plant using chalk instead of limestone for the lime constituent of the raw mix it is understod that for many years trouble was had in keeping a proper regulated mix due to the fact that this light weight material was carried out of the kilns in large quantities by the waste, kiln gases, and this necessitated the carrying of a much higher calcium carbonate content in the original mix to allow for this condition.

These losses in dust carried away by waste gases are felt not only in the cement industry but the blast furnace industry as well.

Some years ago the writer assisted in the experiment made on a type of dust collector in use in connection with a blast furnace to determine whether or not it could be used with a rotary kiln. It was found that the dust collected in the waste gases from the furnace by means of this collector averaged from 1.5 to 2.5% of the total amount of charge fed to the furnace.

So, in the blast furnace industry, as well as the cement industry, there comes up the all-important question of dust recovery.

Is the Dust Any Good?

In the cement industry in particular there comes up the question of whether, in going to great expense in recovering the dust which ordinarily is lost through the stack, is it of any advantage as a cement-making material, or does its reclamation prove advantageous only insofar as the cleanliness factor is concerned?

In a particular case of cement manufacture by the dry process, in which we had two kilns in operation in connection with waste-heat boilers, the amount of flue dust reclaimed through the medium of ordinary dust chambers, together with the dust-collecting hoppers situated throughout the waste-heat system, approximated 7.0% of the total amount of raw mix fed to the kilns. So far as is known, the amount of dust escaping through the stack was a negligible quantity.

Statistics covering a long period of time showed the amount of raw mix required for each barrel of clinker (376 lb.) manufactured to average 595 lb. This gives us a factor of raw mix to clinker of 1.58, or for each ton of raw mix fed to the kilns there is received 3.36 bbl. of clinker. (It is believed that the above figure is slightly under the average received in the majority of cement plants using the dry process of manufacture.)

Analyses of Flue Dust

The flue dust as collected throughout our kiln dust chambers and waste-heat hopper system is elevated to a conveyor situated above the raw tube mill tanks, where it is distributed uniformly to each of the four tanks. This flue dust is, as an average, somewhat higher in calcium oxide content (present as CaO and $CaCO_3$ but determined as CaO) than is the ordinary raw mix.

A typical analysis of several average samples of the flue dust is as follows:

	Sample No. 1	Sample No. 2
SiO_2	10.14%	12.10%
Al_2O_3	3.67	4.30
Fe_2O_3	1.63	1.70
$CaCO_3$ and CaO determined as CaO	43.42	45.40
$MgCO_3$ and MgO determined as MgO	1.52	1.48
SO_3	18.28	24.32
Ignition loss	10.70	3.50
Na_2O	2.04	0.75
K_2O	8.25	5.54

Due to the fact that there is present both calcium carbonate and calcium oxide in the flue dust, the combined flue dust and raw mix as is discharged from the raw tube mills varies greatly in calcium oxide and therefore makes it necessary that the sample of raw mix taken hourly for mix control be taken ahead of the tube mills at the kominuter discharge.

It may be stated here that in passing the flue dust through the raw tube mills, it was expected that better grindability conditions would result, especially when shots of raw material with high moisture content would be had in circulation at times during the rainy season, due to the fact that our limestone was not dried.

Statistics taken over the period of a year failed to show that the flue dust had at any time promoted better grindability of the raw mix, while tests carried out in the small experimental tube mill in the laboratory have

confirmed those results received in the larger mills.

It was found that the ordinary quantities of flue dust, as are ever present in the material discharged from the tube mills, on being fed to the kilns behave no differently in the process of being burned to clinker than does raw mix free from flue dust. This is especially true when the tube mill tanks, the raw silo and the kiln tanks are kept full and not allowed to get low.

Neither was there a marked difference in the quality of the clinker.

Must Not Have a High Percentage of Flue Dust

But, allow the entire raw storage system to become low, and the amount of flue dust in the raw mix to reach a high proportion, an altogether different condition is noticed in the burning of the material in the kiln as is noticed in the quality of the resulting clinker.

When such a condition exists, the flue dust, regardless of its having been thoroughly pulverized and mixed with the raw mix, has a tendency to flush, or flow, throughout the entire length of the kiln to be discharged partly as a clinker in a very poor state of combination, and partly as dust, thus giving an unsound product of very poor strength.

Though we know that raw mix having too large a percentage of flue dust mixed with it will flow rapidly through the kiln and combine into clinker only when the highest heat is applied to it, we have not as yet learned what constituent or constituents of the flue dust is responsible for this condition.

We do know that the clinker burned from such a mixture is of inferior quality and the cement ground from such a clinker is unsound and gives cement of inferior strength.

We also know that a clinker of this nature is exceptionally high in sulphur, as well as sulphides and the alkalies.

A clinker of the above nature shows the following on chemical analyses:

	Clinker No. 1	Clinker No. 2
SiO_2	18.20%	18.30%
Al_2O_3	7.34	7.02
Fe_2O_3	2.26	2.48
CaO	63.18	63.37
MgO	2.02	2.00
SO_2*	1.98	2.05
Ignition loss	1.50	0.70
Na_2	1.12	1.10
K_2O	2.25	2.48
Specific gravity	3.05	3.08

*Sulphur as sulphide not determined.

Cement ground from the above clinker gave the tensile strengths shown below.

Very Little Literature on the Subject

It is noticed in a number of books written on the manufacture and uses of portland cement that it is invariably the habit of the authors to refer to the sulphur, sulphide and alkali content of a cement in a few words to the effect that these constituents, when present in very large percentages, may be considered as beneficial or non-beneficial.

While a great number of experiments were under way in our laboratory dealing with the sulphur, sulphide and alkali problem, no conclusive results were obtained insofar as their ultimate effect on the quality of a cement was concerned.

Appearance of Clinker a Clew

Returning to the flue dust question; when flue dust is present in considerable quantities in the raw mix fed to the kilns we find that on occasions this material may pass through the kiln unobserved except that it may be somewhat harder to combine and requires a higher heat.

The appearance of this clinker from casual observation, as a rule, suggests a product of ordinary quality; however, upon breaking open such clinker we find the opposite to be true.

A clinker of this nature, on being broken open, is found to be of three distinct formations: First, the outside shell which varies in thickness with the size of the clinker, which is apparently well burned; second, the inner shell which appears to be in a poor state of combination and consequently underburned; third, the center, which can be crumbled between the fingers and appears to be composed mainly of flue dust.

Therefore Sample No. 1 shall be described as the hard outer shell of the clinker. This sample has the color, weight and sparkle that is usual with a well burned clinker.

Sample No. 2 shall be described as the inner shell of the clinker. This sample is comparatively light in weight, has a dull brown color and the appearance of being badly underburned.

Sample No. 3 shall be described as the center of the clinker. This sample has very little weight, is of a yellowish color, can be easily crumbled between the fingers and appears to be flue dust.

Analyses of Various Parts of a Clinker Vary

The analyses of these samples of the outer shell, the inner shell, and the center of the clinker is given as follows:

	Sample No. 1	Sample No. 2	Sample No. 3
SiO_2	20.50%	19.00%	17.20%
Al_2O_3	6.60	7.18	6.00
Fe_2O_3	3.90	3.12	2.60
CaO	63.52	61.50	53.91
MgO	1.88	1.88	1.66
SO_3*	0.78	2.22	3.94
Ignition loss	0.90	1.02	9.20
Na_2O	0.33	0.70	1.34
K_2O	1.24	2.80	3.66

*Sulphide not determined.

From the above analyses one could form many idle conclusions as to the reason or reasons causing the formation of such a clinker, so no opinion will be ventured by the author.

All Flue Dust Gave Unique Cement

One of the most interesting happenings in which flue dust played a most important part was experienced some months ago.

With the shutting down of the waste-heat plant for cleaning out and repairs the accumulated flue dust was elevated to the raw tube mill tanks at a time when they contained little or no raw mix.

It so happened that the raw silos and kiln tanks were also low at this time, so that when the kilns were again started up the material fed to them was mainly flue dust.

The action of this material in the kiln was the cause of some anxiety for a period of an hour or more as it flushed throughout the entire length of the kiln and was not combined in the slightest degree at the beginning. The kiln was then rotated very slowly and the flame was focused on the lining about 10 ft. from the discharge end of the kiln. Such a high heat was played on the mixture that by the time it had reached the discharge end of the kiln it had formed into large, molten, sticky balls which had to be raked out of the kiln and forced through the grating to the clinker elevator. This clinker averaged 6 in. in diameter, was greenish in color and on cooling became so hard and tough that it could be broken up only with great difficulty.

Several hundred pounds of this clinker were taken to the laboratory for test. The chemical analysis is as follows:

SiO_2	13.80%
Al_2O_3	5.09
Fe_2O_3	3.51
CaO	46.34
MgO	1.57
SO_3 (no sulphur as sulphide present)	21.95
Ignition loss	0.50
Na_2O	0.85
K_2O	5.54

For test this clinker was then crushed and ground to a fineness of 84.0% passing the No. 200-mesh sieve.

Without adding gypsum to the clinker the setting times were found to be as follows:

Initial set	0 hour, 28 minutes
Final set	3 hours, 20 minutes

A 3.0% admixture of gypsum to the clinker caused the clinker to have the following setting times:

Initial set	0 hour, 30 minutes
Final set	3 hours, 30 minutes

TENSILE STRENGTH 1:3 SAND

Age	Cement: No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Comparison our average cement
3-day	191	209	170	195	170	228	220—270
7-day	246	242	275	278	266	266	305—350
28-day	356	364	362	358	330	383	405—450
3-month	369	342	358	363	361	396	420—505
6-month	365	329	336	330	344	364	435—510
Soundness	bad	bad	bad	bad	bad	bad	OK

The soundness of the clinker was all right.

The normal consistency was 34.0%.

Neat and 1:3 sand briquets that were made up from this clinker gave tensile strengths of 133 lb. per sq. in. for the neats at 24 hours and 62 lb. for the 1:3 sands. The remaining briquets stored in water were found to have disintegrated after 24 hours.

Another lot of briquets were then made up, but after the usual 24-hour storage in the damp closet they were stored out in the open air instead of in the briquet tanks.

Results on these briquets were as follows:

Age	Lb. per sq. in. Tensile strength Neat	1:3 Sand
24-hour (damp closet)	135	58
3-day (air storage)	190	109
7-day (air storage)	252	236
14-day (air storage)	363	380
28-day (air storage)	506	510
2-month (air storage)	475	589
3-month (air storage)	440	638

While it appears to be possible to clinker flue dust at a very high temperature in the kiln and, while the strength of the resulting cement is exceptionally high when specimens are stored in air, it is doubtful whether a cement of this nature could be used to any advantage in the usual classes of construction due to its being subjected to disintegration when exposed to water.

Flue Dust Tried as a Retarder

As our average flue dust had a very high sulphur content, some few tests were made on samples of clinker to determine whether the flue dust would give the same desired effects when mixed with the clinker as is received from the usual addition of gypsum.

The analysis of the clinker used in these comparative tests is as follows:

SiO_2	21.22%
Al_2O_3	7.76
Fe_2O_3	2.74
CaO	64.23
MgO	2.24
SO_3	0.75
Loss	0.60

This clinker was ground to a fineness of 84.6% passing the No. 200-mesh sieve.

The results obtained from the addition of flue dust to the clinker in various percentages are as follows:

	Flue dust admixture test: SO_3, %	Initial set	Final set	Boil	Specific gravity	1:3 Sand tensile Lb. per sq. in. 3 days	7 days
Flue dust	19.55	2.00	4.50	bad	2.94	nil	nil
Clinker	0.75	0.05	0.10	bad	3.14	132	110
Clinker plus 1%	0.94	0.05	0.10	bad	3.14	132	146
Clinker plus 2%	1.13	0.05	0.10	bad	3.13	138	165
Clinker plus 3%	1.32	0.05	0.10	bad	3.13	147	187
Clinker plus 4%	1.51	0.05	0.10	bad	3.12	154	206
Clinker plus 5%	1.69	0.05	0.10	bad	3.12	154	220
Clinker plus 10%	2.75	0.09	0.23	bad	2.97	214	252

	Gypsum admixture test: SO_3, %	Initial set	Final set	Boil	Specific gravity	1:3 Sand tensile Lb. per sq. in. 3 days	7 days
Gypsum	.....	.....	.....	.....	.....	.....	.....
Clinker	0.75	0.05	0.10	bad	.....	132	110
Clinker plus 1%	1.13	0.45	1.40	bad	.....	169	231
Clinker plus 2%	1.44	2.00	4.10	OK	.....	220	275
Clinker plus 3%	1.88	3.00	5.20	OK	.....	259	330
Clinker plus 4%	2.26	4.05	6.40	OK	.....	308	374
Clinker plus 5%	2.64	4.08	6.42	OK	.....	347	429

From the above results obtained it would appear that the SO_3 content found in the flue dust is present, not so much as a dead material as one would be led to believe, as it has in itself some setting and hardening properties which, when mixed with clinker in the proportions shown, slightly aids the strength, though exerts little influence on the setting times.

However, it does not increase the strength of the product in the same proportion as does the gypsum admixture.

Conclusions

Thus, we are still confronted with the flue dust question. Is it detrimental?

In answering this question we can say that when the collected flue dust can be so mixed with the raw mix as to be present in only a small percentage and, where this flue dust does not interfere with kiln operation, or have any detrimental effect on the quality of the resulting cement, it may be considered as beneficial in that it represents a saving in raw material.

On the other hand, we can say that when flue dust is not added correctly to the raw mix, and where its presence in the kiln jeopardizes that kiln's efficiency insofar as fuel economy and output is concerned, as well as causing a poor quality clinker to be manufactured, it may be considered as detrimental.

Washington Sodium Sulphate Deposits Being Developed

ACTUAL WORK IN MINING AND SHIPPING the sodium sulphate deposits in the lakes east of Monse, Wash., will commence at once, according to an announcement made by R. Stenswick, president of the 99 Mining Co., Seattle.

"The 99 company has leased the deposits from the Naso Chemical Co.," said Mr. Stenswick, "and we have a market for all the products we can get out, selling it to manufacturers of paper, glass and rayon silk, besides laundries. The name of the company means 99% pure sodium sulphate, of which there are millions of tons available in the lakes which we have leased from the Naso Chemical Co.

"A warehouse will be established at Okanogan, where a pulverizing plant will be installed for the salt cake form of the deposit which is perfectly dry. A dehydrating plant will be put in at the lake to take the water from the Glauber salts capable of handling about five tons an hour."

The Naso Chemical Co. was organized several years ago by local people to develop the chemical deposits in the chain of lakes in the vicinity of Monse. One of the obstacles to getting out and shipping the product was the question of freight rates, but this difficulty has since been adjusted, it is reported. The lessees expect to give employment to between 30 and 40 men when production is under way at full capacity.

The entire bed of several lakes is composed of this product, which can be shoveled out with comparatively little effort, after the lakes dry up in the summer. These lakes cover about 150 acres in area, and apparently a new deposit is formed each year by the action of the precipitation each winter and spring. There are many millions of tons now in sight with a seemingly unlimited supply available. — *Wenatchee* (Wash.) *World.*

Chemical Engineering Catalog for 1928

THE 1928 edition of the Chemical Engineering Catalogue published by the Chemical Engineering Catalogue Co., Inc., 419 4th Ave., New York, under the supervision of an official committee appointed by the American Institute of Chemical Engineers, the American Chemical Society and the Society of the Chemical Industry, is now ready for distribution to chemical engineers, managers, superintendents, industrial chemists, research chemists, heads of the technical departments in universities or colleges, technical departments of the U. S. government and libraries. This book, under certain conditions will be sent free to those who can qualify under any of the above classifications. It is very helpful to producers of lime, gypsum, silica, feldspar, and other rock products which are finding constantly greater outlets for chemical and industrial purposes, because it contains directories of jobbers and manufacturers of chemicals.

Described in general terms the Chemical Engineering Catalogue is a reference book for the chemical engineer, consisting of a compilation of condensed catalogue data supplemented by classified indexes of equipment, supplies, chemicals and materials. The main purpose of the catalogue is to inform the chemical industry rather than advertise. The catalogue is well illustrated. It contains 1100 pages covering the equipment used in the various chemical industries, including sugar, cements, fertilizer, paints and varnishes, paper and pulp, leather, textile, bleaching and dyeing, metals, ores, rubber, soaps and many other industries.

Brick From Lime-Kiln Waste

Fine Lime and Ash from Mixed-Feed Kiln Make Good Building Product at El Paso, Texas

By Edmund Shaw
Contributing Editor, ROCK PRODUCTS, Los Angeles, Calif.

KLINKER BRICK is the trade name of a brick made from cinders and hydrated lime. At present the only plants making it are in El Paso, Tex., where it was invented and patented by Clarence North, president of the El Paso Building Material Co. It is somewhat curious that such a product had not been invented before, as the cementing power of a mixture of lime and cinders has long been known and masons have used it for topping chimneys and in other work where a weather resisting mortar was needed.

By steam curing, as a sand-lime brick is made, the cinder-lime brick become much harder than it would by setting in air, at least in any reasonable period of air setting. The strength of the cured brick is about that of good concrete, the compressive strength running about 3500 lb. and the modulus of rupture 650 lb. The absorption of the brick can be varied in the process, and it is possible to make a brick with almost no absorption, but such brick would slide in the wall and be altogether unsatisfactory. For practical reasons the absorption is kept at 10%. The weight is about two-thirds that of a common clay brick.

Both companies making these bricks in El Paso operate lime kilns and use the waste from the kilns as the lime content of the brick. The kilns are of the "pot" or mixed-feed type and only the coarse lump lime is sold. After forking this out there is left the fines and overburned pieces with a little cinders and ashes and all this goes into the bricks. It is about 10% of the weight of the mix.

The process is practically identical in both plants. The plant and method to be described is that of the El Paso Building Material Co., and the plant is one which Mr. North designed and erected quite recently. It had a capacity of 20,000 brick per day, when it was visited, but plans had been made for doubling the capacity and some of the machinery had been ordered.

Slaking the Lime

The first step in the process is to hydrate and cure the lime waste, and this is done by a method that would only be applicable where cheap labor is obtainable. The fines from the kilns are stacked in a long heap and a laborer starts at one end and draws out some which he spreads in a thin layer on the ground. This is wet with a hose and then stacked behind him and he works through the pile in this way. The pile of hydrated lime is allowed to stand for several days, and in this time all the overburned pieces are thoroughly slaked. When material of this kind is used the curing process is necessary to avoid unsoundness, but of course it would not be necessary where thoroughly hydrated lime was used.

Cinders are bought from the railroads and industrial plants, principally from the railroads. They are always wet; in fact they contain so much water that it is not necessary to add any in the operations that follow. They are brought into plant at one side of the building in wheelbarrows and dumped into a 9-ft. American Clay Machinery Co. grinding pan. This is the same machine that is commonly used in grinding clay and shale for brick making, two heavy solid wheels at the ends of a short shaft running on a circular track in the pan. A similar machine is much used in the silica sand industry for grinding sand rock

The lime is also brought in by wheelbarrows and placed in a heap beside the mill and a workman adds the required number of shovelfuls as each barrow of cinders is dumped.

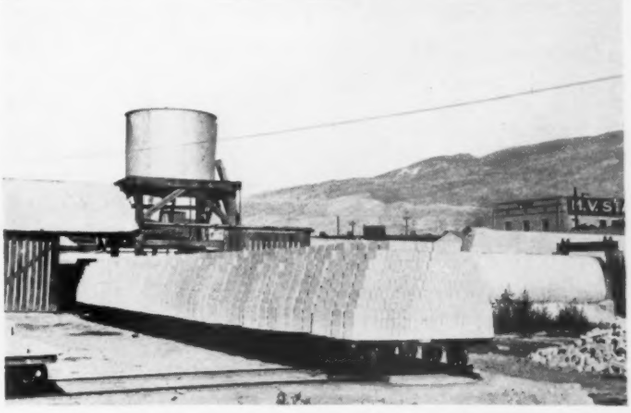
The discharge from the mill is by a power shovel worked by a laborer, and it is intermittent to correspond with the intermittent feeding. The feeding and discharging is efficient but crude, and construction work was going on to install other arrangements when the plant was visited. These included a hopper for the cinders and lime and a feeder which will be automatic and labor saving.

Sand-Lime Brick Process Used

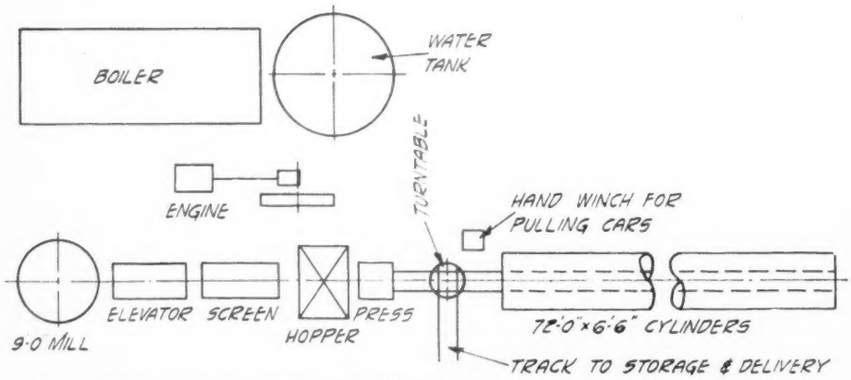
From the mill the material passes to a 12-in. bucket and belt vertical elevator, 30 ft. high. It discharges to a rotary screen 8 ft. long and 48 in. in diameter, which has ½-in. holes. The oversize goes back to the mill. The undersize falls into a hopper which is 5 ft. by 8 ft. at the top and 45 deg. sides. This is the feeding hopper of the press.

The press in use is a Berg of the type used for making fire brick. While it is possible to make a good brick in such a press, Mr. North said that he considered the Jackson and Church revolving press, the kind commonly used for making sand-lime brick, to

Rear of the Klinker Brick plant, showing piles of lime waste hydrating and curing



Cars being taken from the cylinder. Note the stirrup suspension of the cylinder shown at the extreme right



General layout of the El Paso Building Material Co. plant for making brick from lime-kiln waste

be much superior for the work. The remainder of the equipment in the plant is standard sand-lime brick equipment.

The brick are taken from the press by two off-bearers and placed on cars of the usual pattern, each car holding 1000 brick. These are run into the hardening cylinder, which is 72 ft. long and 6 ft., 6 in. inside diameter. This is hung in stirrups made of a 10 x 10-in. timber hung by 1½-in. rods from a frame of 10 x 10-in. pieces. The

Hydrating the lime waste for curing

swing of the rods is sufficient to take care of the expansion, this stirrup suspension being a substitute for the usual roller mounting. The cylinder is insulated by 2 in. of "Cel-o' Air" (the trade name of a California diatomaceous earth) and covered with a light sheet metal lagging.

Ingenious Method of Handling Brick

Owing to the shape of the ground available the cars of brick have to be drawn out of the same end that they were pushed into, and this is done in rather an ingenious way. The first car put into the cylinder carries a hook attached to a wire rope long enough to reach through the cylinder. When the cylinder is opened after the bricks are cured the end of this rope is attached to a small hand winch. Winding this winch pulls out the first car which pushes all the others before it.

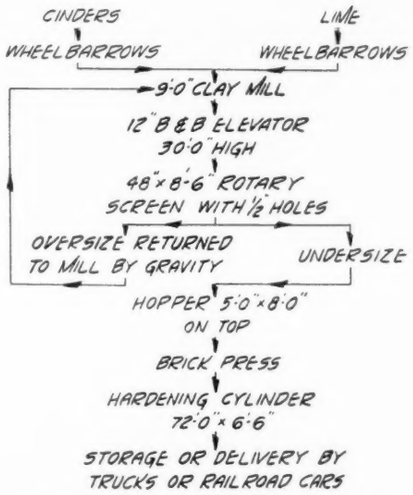
Each car as it is run out passes on a turn table and is swung around at right angles and sent into the yard. There were very few bricks in storage at the time the plant was visited for the plant was far behind in its orders.

Deliveries are made both by truck and by railroad. For loading railroad cars the brick cars are run to a small hydraulic elevator that lifts them high enough so that they can be run into the railway car.

The power plant is an 80-hp. Erie steam engine taking its steam from the boilers that supply the hardening cylinder, but this is in the nature of a temporary arrangement and an electric motor will take its place when the capacity of the plant is increased. For the present capacity it works well as the boilers are used to supply steam for the engine in the daytime and for hardening the bricks at night. With an increased output the boilers will supply steam to the cylinder all the time.

At the end of the boiler is a large water tank from which the boiler feed is taken. The exhaust from the engine goes into a pipe that passes through this tank to a dome at the top where it meets a spray of cold water from the city mains. This condenses the steam so that the engine practically runs condensing, and the steam heats the water that is fed to the boiler. The size of the tank has been calculated to that when night comes the tank is full of hot water to be fed to the boiler to make steam for hardening the brick; and it is free from oil because the exhaust passes through a steam trap of Mr. North's design before it goes to the tank.

This tank also supplies water for the hydraulic elevator that lifts cars of brick to the railroad cars, mentioned above. Even this is not wasted as with the condensate of the cylinders it is pumped to a water tank from which the plant supply is taken. A good deal of water is used in the plant, but the water bill is small because so much of it is circulated and reused.

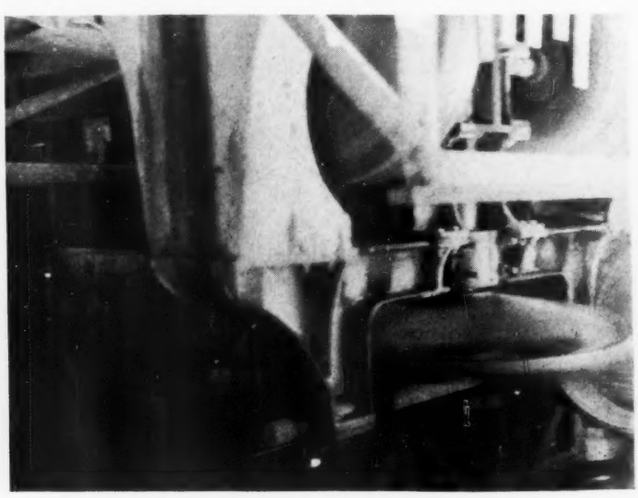


Flow sheet for the El Paso Klinker Brick plant

A Real Demand for Product

Klinker brick have been in use in El Paso now for more than six years and their strength and soundness have been well proven. They are put to all the uses that brick are put, for facing, for backing up and for use under stucco. They have shown up especially well for use under stucco, the surface of the stucco which covers them being remarkably free from hair cracks.

Common clay brick sell for $12.50 a thousand in El Paso, or did when this article



The grinding pan at the El Paso plant

was written. Klinker brick can compete with common clay brick easily at this price.

Production of High-Alumina Slags in the Blast Furnace

THE United States Bureau of Mines has been conducting a series of investigations relating to the smelting of iron ores for the past 10 years. Technical Paper No. 425, published by the Department of Commerce, reviews the progress of this work as undertaken by T. L. Joseph, S. P. Kinney and C. E. Wood.

Early investigations were prompted by the apparent need for more information regarding the physical properties of blast-furnace slags. As a result of systematic measurements the viscosity of blast-furnace slags was determined over a wide range of composition and temperature. One of the points covered in the slag-viscosity studies was the effect of varying percentages of alumina upon viscosity.

As the effect of alumina upon blast-furnace slag influences the efficient production of pig iron, the Bureau of Mines entered into a co-operative agreement with the Aluminum Co. of America and the University of Minnesota School of Mines Experiment Station to make an experiment for determining the practicability of smelting a charge of bauxite and iron ore mixed with enough limestone to produce a slag approaching the following composition: 47% to 48% of Al_2O_3, 41% to 42% of CaO, 4% to 5% of SiO_2, 2% to 3% of TiO_2, 1% of FeO, 1.8% of MgO, and 1% of S.

In addition to determining whether or not operating a blast furnace on slag approaching the composition given above was practicable, a quantity of slag was needed for a series of experiments to disclose the relative ease of extracting alumina from slag made in the blast furnace as compared with extracting it from raw bauxite. The value of the slag as a raw material for making aluminum as compared with the value of bauxite for the same purpose would depend upon the relative percentages of alumina available for extraction in the two materials and the cost of extraction. The practice of smelting high-iron bauxites in the blast furnace with a view to later extraction of the alumina from the slag produced would, if feasible, save the iron now wasted.

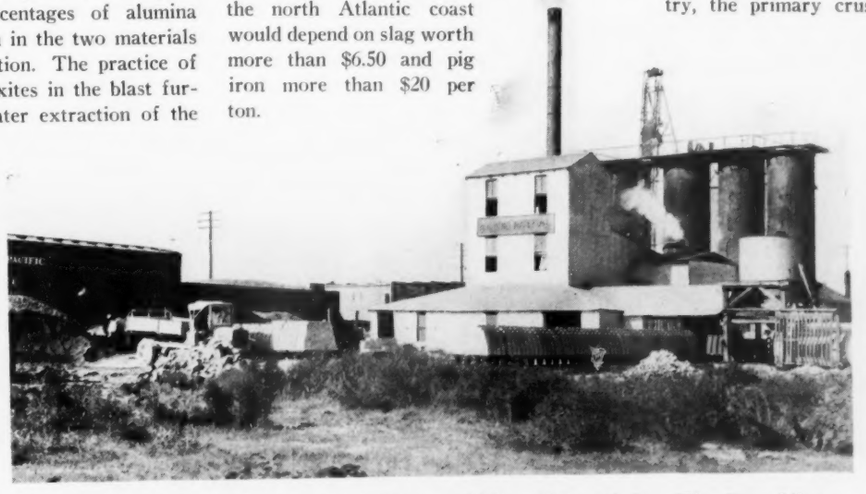
Melting-point determinations showed that a furnace could be operated on slags containing 47% to 48% of Al_2O_3, 41% to 42% of CaO, 4% to 5% of SiO_2, and small percentages of TiO_2, MgO, and S. Slags containing CaO and Al_2O_3 usually have the lowest melting points when the percentage of CaO exceeds the percentage of Al_2O_3.

Viscosity determinations in the ternary system CaO-Al_2O_3-SiO_2 show that the ternary eutectic, composed of 49.5% of CaO, 43.7% of Al_2O_3, and 6.8% of SiO_2, has a relatively low viscosity and that only a small change in viscosity takes place with changes in temperature above the melting point.

During a two-week test experimental furnace slags were produced covering the following ranges of composition: 6% to 33% of SiO_2, 35% to 52% of CaO, 18% to 53% of Al_2O_3, about 2% of TiO_2, about 1% of FeO, and 0.5% of slag. No difficulty was encountered in operating the furnace on slag of this wide range of composition.

The cost estimates for a burden of bauxite, limestone and borings indicate that profits in operating on the north Atlantic coast would depend on slag worth more than $6.50 and pig iron more than $20 per ton.

Hydraulic elevators lifting the brick cars to the height of the railroad cars



Cinder-lime brick plant of the El Paso Building Material Co. The lime kilns show in the right background

Gypsum Production in Mexico

THE payment of import duty on crushed gypsum will be gotten around by one importer by doing the preliminary crushing at an American plant according to the *Long Beach* (Calif.) *Press Telegram* as follows:

"When the barge *Daylight* left Long Beach harbor recently for San Marcos Island, she carried a deck cargo of about 50 tons of water for use on the island where most of the Pacific Coast gypsum is mined. The barge is the property of the Mexico and Alaska Navigation Co., which hauls the gypsum from the island for the Standard Gypsum Co. plants at Long Beach and Seattle. The barge is towed back and forth between the island and Long Beach by one of the steamers of the company and went south this trip with the *El Cedro*.

"San Marcos Island lies in the Pacific off the west coast of Mexico about 1200 miles south of here. The Standard Gypsum Co. has the rights to the entire island, which contains an unlimited supply of gypsum rock, which is mined and sent by means of a conveyor along a wharf landing out to great bins from which chutes drop it into the steamers or barges. The island is about seven miles long and three or four broad and has only the one settlement maintained by the company where upward of 200 persons reside. Nearly all of them are Mexicans working in the open face mines. It is possible to get water from Guaymas much nearer, but the steamers do not always touch there, so three great water tanks are maintained on the deck of the *Daylight* and water for domestic uses is transported 1200 miles.

"Recently the equipment at the island was increased about 100% by additional machinery taken down there. The rock at the island is given a primary crushing to about 3-in. mesh before being loaded on the steamers or barges. This is not essential but facilitates the work. If the United States government finally determines to maintain the duty on gypsum rock crushed at the mine before being brought into this country, the primary crushing will have to be done at the Long Beach mill. The rock will then be taken out as mined, averaging about 6 in. size.

"The Long Beach mill is running practically full time on three shifts employing about 30 men. Ordinarily the company handles from 35 to 40 men here, and the force probably will be built up again shortly as the demand for the plaster has been maintained even in the present period.

Where and How to Find Minerals

By Morrell G. Biernbaum
Honorary President, Rocks and Minerals Association

MOST beginners, in the study of mineralogy, sooner or later ask that question: "Where do we look for specimens?" A further question that comes up later is "How do we find them when we get there?" As these two questions are so closely allied, I believe it best to consider them as one.

In order to properly approach the question, a few fundamentals will have to be considered. A mineral, in the usual sense, is a natural solid element or individual chemical compound of definite form and physical characteristics. A rock is usually a mixture of minerals, although this is not absolute as in the case of marbles and serpentines, in which the white limestone or marble is pure calcite and the rock known as serpentine is composed, largely, of the mineral serpentine.

However, in both the above cases, minerals of distinctly different composition and characteristics occur in these rock formations, sometimes in considerable quantities, and, as the above cases represent but two minerals of a total of over 1000, they can be considered exceptions to the general rule. Ice is, strictly speaking, a mineral, but minerals are usually confined to the compounds containing at least one solid element; that is, solid in our normal temperature range. Mercury is the sole exception to this rule, but it is a metal and is classified with the other metals as iron, lead, zinc, etc.

The native hydro-carbon compounds such as amber, coal, paraffin, etc., are, of course, really a connecting series between the mineral and vegetable kingdoms, and are not generally considered when one speaks of a mineral specimen.

A *DIKE* is an intrusive rock forced up originally in a molten condition by volcanic action from below, and may appear in any surface rock formation. If the intruded material spreads out at the surface, it is usually called a *FLOW*.

A *HYDROTHERMAL VEIN* is similar in physical characteristics and mode of occurrence to a dike, except that it was formed by hot-water solutions being forced up from below, which, upon cooling, deposited out various minerals, some foreign to the rock formation, others derived from the dissolving action of the original solutions while passing through the rock formation itself.

METAMORPHISM is the result of the action of heat and pressure on certain rocks. The heat may have been caused by terrific pressure alone, or by the intrusion of dike materials, or even develop adjacent to hydrothermal veins. The resulting action consists of the segregation of the various chemical constituents of the original rock into individual minerals. An example of this would be found in a white crystalline limestone, in which the original limestone, made up of a variety of elements in one solid mass, is turned into pure calcite, and many minerals occur crystallized individually in the white mass.

Another important source of mineral deposits is from percolating surface waters which, at some time in the past, had been of acid nature, dissolving up various minerals en route, and redepositing the same or other compounds at some time later when the solutions either became super-saturated or came in contact with alkaline solutions. The minerals so redeposited are commonly known as *SECONDARY MINERALS*. Calcite stalactite formations in limestone caves are a typical example of such secondary deposition.

Now that we have passed the consideration of these fundamentals, it is necessary to have some idea of the physical characteristics and chemical composition of the various rock formations.

(A) *LIMESTONE*. The limestones, as well as the sandstones, shales, conglomerates and slates, were originally deposited from sea-waters or ancient inland lakes, and are usually grouped together under the general classification of *SEDIMENTARY ROCKS*. They consequently all contain such sea and lake water elements as calcium and phosphorous (from bones), carbon (from animal tissues), magnesium, potassium and sodium (from various sea-water salts), etc.

In appearance, the limestones must be classified into two divisions; the normal or unmetmorphosed, and the metamorphosed or crystalline limestones. Calcium carbonate (calcite) being the principal ingredient of limestones, and being very easily fusible, the limestones would naturally show the result of metamorphic or hydrothermal action more so than other less fusible rocks. The normal limestone is a gray, finely-crystalline rock, frequently of bedded structure, composed in the main of an intimate mixture of impure calcite and dolomite, and consequently, easily cut with the knife-edge. The metamorphic limestone is usually a white, coarsely-crystalline, calcite mass, the cleavage quite visible to the naked eye.

(B) *SANDSTONES, SHALES* and *CONGLOMERATES*. These formations are also sedimentary deposits but are those in which the water elements did not crystallize out of the water, only the weathered rock brought down by rivers and streams, depending to make these formations. They were probably deposited from inland fresh-water lakes in the most part. These rocks consist of little else but sand and pebbles naturally-cemented together, usually by common iron oxide. They are easily recognizable by their composition and oftentimes by their bedded structure. At times, they are found as *QUARTZITE*, a compact hard quartz rock formed by the fusion of sand grains due to metamorphic action.

(C) *SERPENTINES*. The serpentines were all intrusive rocks and consist primarily of the various forms of magnesium silicates. In appearance, they are of a dirty-green color. The mass is very irregular, showing no distinctive structure. Normal serpentine, having a hardness of around 4, is scratchable with a knife. At some places the serpentine rock is altered entirely to talc, which, of course, is easily recognizable by its softness.

(D) *TRAPS*. The trap rocks all belong to the intrusive dike or flow group of formations and are composed primarily of various aluminum silicates. In appearance, they always have a very dark gray to black color. They have no distinctive structure. The fine-grained varieties are very compact and hard and break into irregular blocks. The coarse-grained varieties resemble some gneisses in appearance from a distance but do not have the layer structure of the gneisses.

(E) *GNEISSES* and *GRANITES*. These rocks are essentially of the same composition, being primarily composed of quartz, feldspar and mica, with some hornblende. The true granites are very coarsely crystalline intrusive rocks of no distinct general structure. The true gneisses are usually more finely crytalline in structure, higher in mica content than the granites, and occur in a layer structure, similar in appearance to the bedding characteristics of the sedimentary rocks, but formed this way by the development of crystallization of the minerals at right angles to the direction of external pressure, a well-recognized normal physical phenomenon. The true gneisses are generally considered to be the oldest rocks of the earth.

(F) *PEGMATITES*. A pegmatite vein, or dike, as it is sometimes called, is a very coarse granite-like vein usually found apparently penetrating gneisses, although at times penetrating other formations. The general mineral characteristics of a pegmatite are similar to those of granites. The origin of pegmatite veins is a moot question; some believe them to be always intrusive;

Reprinted from *Rock and Minerals*.

others believe them to be replacements. It is quite possible that either belief is correct, depending on the particular vein in question. All agree, however, that they were formed subsequent to the rock formation that they are found in. In mode of occurrence, they usually run in irregular direction through the gneiss or other rocks, frequently at right angles to the layer structure. They vary in width from a few inches up to several hundred feet in certain areas. A true pegmatite vein should not be mistaken in a gneiss formation to the quartz veins which sometimes occur running parallel to the layer-structure of the gneiss. Such quartz veins are almost universally barren of minerals, being merely concentrations of silica in the gneiss rock. The pegmatites frequently contain quite a variety of rare and semi-rare minerals distinctly foreign to the surrounding rock.

(G) There are a number of less common rocks, such as the *NEPHELINE-SYENITES*, which will not be discussed in this article.

The table of rock formations and minerals accompanying this article is given with no attempt to list all the minerals to be found in any particular rock formation, but only to serve as a general guide to the beginner. A little elementary chemistry will be found to be of considerable help in the field in helping to identify certain minerals associated with a particular rock formation, as frequently the elements which are represented by the rock formation itself are reflected in the chemical analysis of the minerals found in such formation.

The table, if considered in conjunction with explanatory data herein noted, will certainly serve to assist the beginner in locating minerals at the place where they should or may be found. It will serve to save him considerable wasted time at some quarries, mines or road-cut exposures where the rocks are unproductive of mineral specimens. For instance, there is a quarry which, upon close examination, proves to be a trap rock. There is only one series of minerals to look for. These are all secondary minerals and will be found only in cracks, seams or holes in the trap rock. If there are no such openings in the rock, nothing is likely to be found there unless some previous blast had contained such cracks, in which case a glance at the rock in the quarry from the previous blast will tell you at once if there is any hope.

A typical example of this is the Paterson-Bergen hill zeolite district of New Jersey. These formations are trap flows, and, while at certain points the zeolites are plentiful, the vast majority of the formation is merely solid trap rock, and no minerals are to be found. However, sometimes the minerals, while not plentiful, are there in small amounts, and a rock exposure should not be discarded as mineral-barren until it is looked over carefully along the lines suggested.

Another example is that of a limestone quarry. Upon examination, it is found to be of the gray, fine-granular texture, typical of the unmetamorphosed limestones. Bedded structure is usually quite noticeable in such limestones. Outside of occasional cracks filled with secondary calcite crystals, or a patch of massive cleavable dolomite, little should be found unless at some part of the quarry the bedded structure will be entirely eliminated and the limestones here be found quite coarsely crystalline, in which case there is distinct evidence of metamorphism of some sort. At such a place, all the time should be spent, as this metamorphosed area is the only place where minerals are apt to be found.

The writer desires, at this point, to touch on another phase of mineral collecting. There are some localities where, while there are no hand-size specimens to be found, there certainly are some very fine specimens of small areas of minute crystals which, when broken up and mounted in a small cardboard box on a piece of cork, make truly magnificent specimens when viewed under a miscroscope of medium power. The collector should always bear this in mind when hunting for specimens, as this offers an additional objective in the way of a mineral collection. There are several such microscopic collections in the east, some of which are a wonderful delight and surprise to the observer and amateur collector.

Little mention is made in the table of the metallic-element minerals. While some of these are occasionally found sparingly in almost all rock formations, the vast majority come from the various metal mines. At such localities, various of the metallic salts are

GUIDE TABLE FOR MINERAL COLLECTORS

GENERAL FORMATION	SEDIMENTARY					INTRUSIVE				NATIVE
SPECIFIC FORMATION	LIMESTONE		SANDSTONE, CONGLOMERATE, SHALE		SLATE	SERPENTINE	TRAP	GRANITE	PEGMATITE	GNEISS
	NORMAL	METAMORPHOSED OR HYDROTH. VEINS	NORMAL	METAMORPHOSED						
PHYSICAL CHARACTERISTICS (SOFT: SCRATCH WITH KNIFE) (HARD: NO KNIFE SCRATCH)	GRAY, SOFT, BEDDED	WHITE, SOFT, CRYSTALLINE	GRAY TO RED, SAND & PEBBLES	GRAY TO RED, SOLID MASS, IRREGULAR GRANULAR STRUCT.	SLATY	GREEN, SOFT, IRREGULAR	BLACK TO DARK GRAY, HARD, IRREGULAR	IRREGULAR MIXTURE FELDSPAR, QUARTZ, MICA	SAME AS GRANITE BUT MUCH COARSER	SAME AS GRANITE BUT IN LAYERS WITH MUCH MICA
PRINCIPLE ELEMENTS	Ca, P, C, Mg	Ca, P, C, Mg	Si	Si	Ca, Si	Mg	Al	Al, Na, K	Al, Na, K	Al, Na, K
	CALCITE DOLOMITE	GRAPHITE ANDRADITE RUTILE APATITE HORNBLENDE PYROXENE WERNERITE WOLLASTONITE TOURMALINE PHLOGOPITE SPINEL TITANITE ZIRCON FLUORITE	NONE, EXCEPT OCCASIONAL SECONDARY DEPOSITION SUCH AS PYRITE, MARCASITE.	ZEOLITES AND ASSOCIATED SECONDARY MINERALS IN CRACKS (SEE "TRAP MINERALS")	NONE, EXCEPT OCCASIONAL SECONDARY DEPOSITION SUCH AS PYRITE, MARCASITE	SERPENTINE TALC DEWEYLITE CHROMITE & CHROME MINERALS SEPIOLITE MEERSCHAUM ALBITE ANTHOPHYLLITE BRUCITE CLINOCHLORE ENSTATITE MAGNESITE TREMOLITE ACTINOLITE MAGNETITE	COPPER & COPPER MINERALS ZEOLITES STILBITE NATROLITE THOMPSONITE SCOLECITE CHABAZITE GMELINITE HEULANDITE ZEOLITE ASSOCIATES APOPHYLLITE DATOLITE PREHNITE PECTOLITE EPIDOTE GYPSUM	NONE IN NORMAL GRANITE, EXCEPT SECONDARY ZEOLITES IN CRACKS, EXCEPTION IN CASE OF PEGMATITE VEINS (SEE "PEGMATITE")	MICROCLINE ALBITE MUSCOVITE BIOTITE BERYL APATITE ALMANDITE SPESSARTITE TOURMALINE GOLD LITHIUM MINERALS LEPIDOLITE LITHIOPHYLLITE RARE EARTH MINERALS RADIO-ACTIVE MINERALS TORBERNITE AUTUNITE ALLANITE COLUMBITE ETC.	ALMANDITE SPESSARTITE STAUROLITE CYANITE SILLIMANITE SECONDARY ZEOLITES ETC. IN SEAMS & CRACKS PEGMATITE MINERALS

frequently found in seams in and adjacent to the ore bodies. The accessory minerals occurring with such ore bodies are usually dependent primarily on the adjacent rock formations.

A final word before closing regarding the sedimentary rocks in general. There is no exact line of demarcation between the various sedimentary rocks. We have the limestones, sandstones, conglomerates, shales and slates all included in this general class. None of them are productive of minerals (except occasional secondary minerals) excepting the metamorphosed limestones or the normal limestones with hydrothermal veins. All these rocks in their normal bedded formations are practically barren of mineral specimens.

Rock Gardens

IN A NEW BOOK entitled, "Rock Gardens" by F. F. Rockwell, one of a series of Home Garden Handbooks published by the Macmillan Co., New York, the author tells where and how to make a rock garden, what plants to use and where to put them. Rock gardens are usually associated in the mind with estates but there is no reason why the smaller suburban owner should not be interested in this fascinating phase of gardening. It means a new outlet for operators of crushed-stone plants. Rough pieces of rock of about 1-man size are usually required; also slabs.

The editors call attention to this book because rock gardens offer an outlet (and it should be a profitable one) for operators of crushed-stone quarries. Here is one market that can stand development in nearly every location where an operator is alive enough to cater to a popular fad.

Reducing Power Costs in a Stone Plant

POWER cost is such an important item in stone plants that any reduction in this cost represents an important increase in the profits. That it is possible to make a very substantial saving with Diesel power is shown by the experience of the William Penn Stone Co. of Sandstone, Minn., which produces cut stone. Here power costs were reduced from 2½ cents per kilowatt hour with purchased power to 0.9 cents per kilowatt hour with Diesel units, according to an article in the December 1 issue of *F. M. News*.

It was in the early part of 1927 that Mr. Penn first became interested in the possibilities of Diesel power and at that time a careful survey was made to determine what might be accomplished with Diesel engines. Power costs for the year 1926 were tabulated and a graphic wattmeter test was taken to determine the average load conditions. The power bill for the year 1925 was $5180.35 for 205,570 kw.

From this it will be observed that the average cost per kilowatt hour was something over 2½ cents. An estimate of the cost of operation with Diesel engines showed that this would not exceed 1.05 cents per kilowatt hour, including a liberal allowance for maintenance.

It was, therefore, decided to purchase a 120-hp. Diesel generating set and the unit was placed in operation in June of that year. The results were even more favorable than was anticipated, due largely to the fact fuel oil was purchased in carload lots at a cost of approximately 5½ cents per gallon delivered at Sandstone. On the basis of this price of oil and including the cost of lubricating oil and an allowance of 2% for maintenance the cost came down to less than 1 cent per kilowatt hour.

Abrasive Hardness of Flooring Materials

NUMEROUS INQUIRIES concerning the wearing qualities of certain types of flooring materials have led to a study of the abrasive hardness of certain stones, such as are commonly used for flooring in the more permanent construction, by the U. S. Bureau of Standards. It was necessary to develop a suitable testing device and to determine if the results obtained were reliable. Comparisons have been made between the test results and actual wear measurements on 33 samples, including various marbles, limestones, and slates.

The comparisons indicate that some materials may wear at a somewhat different rate under the conditions of actual service than is indicated by the testing apparatus, but, in general, the information gained from the tests appears to be of considerable value. The apparatus consists of a rotating steel disk, a means of holding and rotating the specimens on the disk under a constant pressure, and a means of feeding an abrasive at a constant rate. The amount of abrasion during the same interval of time is obtained by weighing the specimens before and after the test and then reduced to the actual volume abraded by dividing by the apparent specific gravity of the specimen. The result is expressed as the reciprocal of the volume abraded as follows:

$$H_a = \frac{10}{\frac{2000}{2000 + W_s} \times \frac{W_a}{G}} = \frac{10(2000+W_s)G}{2000W_a}$$

in which H_a = abrasive harness, W_s = weight of specimen, W_a = weight of abraded material, and G = apparent specific gravity of the specimen. The specimen is pressed on the grinding disk by a superimposed weight of 2000 grains and the fraction $\frac{2000}{2000 + W_s}$ represents the correction of the weight of the specimen itself. The reciprocal is arbitrarily multiplied by 10 in order to avoid fractional values for soft materials. This means of expressing the results places the abrasive hardness results in order of the usual concepts of hardness.

Tests have been made on marbles from 50 quarries, limestones from 30 quarries and slates from 20 quarries. The so-called Verde Antique marbles (serpentines) gave very high H_a values, while some of the saccharoidal marbles give low values. Limestone, likewise shows a considerable range in hardness, the very dense crystalline varieties giving high values, while the oolitic limestones usually give low values.

Slates from different sections of the country are indicated to be less variable in hardness.

The following range values obtained in the tests completed will convey some idea of the hardness of different materials:

Verde Antique marbles	78 to 104
Siliceous marbles	25 to 35
Calcite and dolomitic marbles	7 to 25
Crystalline limestones	15 to 20
Oolitic limestones	4 to 12
Slates	7 to 12

—*Technical News Bulletin*, of the U. S. Bureau of Standards.

Canada's Quarry Industry

THE PRODUCTION of stone from Canadian quarries during 1927 advanced 14% over the total for 1926, according to revised statistics just issued by the Dominion Bureau of Statistics. In 1927 shipments amounting to 7,306,436 tons, valued at $9,265,304, were recorded as compared with 6,397,590 tons, worth $7,865,874, shipped in the previous year.

Ontario was the leading producer with 58.2% of the total output. Quebec followed with 34.7% and the other provinces in order of tonnages produced were: British Columbia, Manitoba, Nova Scotia, New Brunswick and Alberta.

The 222 firms operating in the stone quarrying industry in Canada during 1927 reported a capital investment of $13,810,984. Salaried employes and wage earners employed during the year totaled 5071; their combined earnings amounted to $4,571,605. Fuel and electricity consumed caused an outlay of $496,503.

Prison for Bad Sand

CLOSE upon the catastrophe in Prague, when a building in course of erection collapsed and killed at least 46 men, seven persons have been prosecuted in Vienna for conspiring to deliver to the Vienna municipality inferior sand for making concrete for new municipal blocks of flats.

Ferdinand Traub was sentenced to six months' hard labor, and the other six to from five to one month's imprisonment. The sentences would have been more severe, said the judge, had not full compensation been paid.—*Cement, Lime and Gravel* (British).

Old vs. New Methods of Calculation of Portland Cement and Clinker Analyses

By E. L. Drury
Chief Chemist, Mildred, Kans., Mill, Consolidated Cement Corporation

SINCE THE BEGINNING of extensive manufacture of portland cement, and also before it appeared in very great quantities, there have been various investigators propounding ratios and formulas for control work in the mill laboratory and for comparison analytically of the various brands of portland cements. None of these in general use today seem to give any satisfactory results other than just something to go by and think about. It is a known fact that good portland cement can be made from raw materials which give results as shown by analyses to vary all the way from the lowest to the highest permissible ratios which have been devised for checking resulting products, even in some cases these ratios will be entirely out of the limits laid down by the earliest investigators and still result in an exceptionally good cement.

When any certain deposit, which has been examined and found satisfactory for cement manufacture, where only one each of the argillaceous and calcareous materials are used, certain of these ratios will remain constant and cannot be changed unless a third material is brought into use and incorporated into the mix.

In a great many mill laboratories it is the common practice to use these ratios altogether for control work. Of the major points stressed by the investigators, SiO_2/Al_2O_3; SiO_2/R_2O_3; Al_2O_3/Fe_2O_3 and $CaO/SiO_2 + R_2O_3$, the first three, in a uniform deposit will remain constant, and the fourth or lime ratio will be varied according to the mill chemist.

Under ordinary conditions where the raw materials have been established and a knowledge of what quality of cement can be manufactured from these deposits, these ratios do in all respects serve satisfactorily. However, in the present trend of manufacture and the demand of the consumer for high early strength and so called quick-hardening cements, the manufacturers have done considerable research and experimenting to satisfy these desires with a standard portland cement, which can be expected to have these qualities and still be manufactured so there will be little or no additional expense either to the consumer or manufacturer.

New Light on Composition Control

In the past few years there has been considerable discussion and controversy as to the probable composition of portland cement. There have been a few ideas generally accepted among the foremost investigators which throw new light and a different angle on the chemical control, and on a comparison of different elements in portland cement manufacture, which would seem to change the general and probably most universal methods of laboratory calculation of mill control, namely the ratios mentioned above.

As cement analyses are reported by the analyst they certainly do not represent much more than a division of a chemical mixture. When transposed* to the various compounds which are more or less accepted as the composition of portland cement, they present a rather interesting study; and they certainly do in experimenting with new materials and revamped mixes.

Of the most notable and some that are now before the chemists of cement plants are the experiments and results reported by Alton J. Blank in recent issues of ROCK PRODUCTS. To express my views on chemical calculations for control and comparison of cements and clinkers I will deal with the analyses reported in Mr. Blank's article of September 1, 1928, issue of ROCK PRODUCTS.

Effect of Iron Oxide

There is no doubt, and I think it will be agreed by the majority of cement chemists, that these articles and results are interesting and valuable information. Having been connected with a product of high-iron content I readily agree with results found by Mr. Blank, and I do not intend to discount this valuable work; but I merely desire to show where the old methods of calculation and comparisons are seemingly at fault. I am, however, taking it for granted that in these experiments the mixes were designed to give the same lime ratio in each case, and that these ratios would more or less reflect the quality of the resulting cement.

In comparison of the different mixes to which I refer, I have taken an average of the three reported analyses in the above mentioned article:

NO. 1

Clinker burned from normal raw mixtures:

Silica (SiO_2)	20.83
Alumina (Al_2O_3)	7.62
Iron oxide (Fe_2O_3)	2.98
Calcium oxide (CaO)	64.58
Magnesium oxide (MgO)	2.18
Sulphur trioxide (SO_3)	0.54
Loss on ignition	0.37

NO. 2

Clinker burned from normal raw mix to which iron oxide has been added:

Silica (SiO_2)	19.77
Alumina (Al_2O_3)	7.31
Iron oxide (Fe_2O_3)	4.56
Calcium oxide (CaO)	64.80
Magnesium oxide (MgO)	2.18
Sulphur trioxide (SO_3)	0.49
Loss on ignition	0.36

NO. 3

Effect of additions of iron-containing slag on the composition of portland cement clinker:

Silica (SiO_2)	20.23
Alumina (Al_2O_3)	6.19
Iron oxide (Fe_2O_3)	5.13
Calcium oxide (CaO)	64.74
Magnesium oxide (MgO)	2.18
Sulphur trioxide (SO_3)	0.48
Loss on ignition	0.34

RATIOS

	No. 1	No. 2	No. 3
SiO_2/R_2O_3	1.965	1.668	1.788
SiO_2/Al_2O_3	2.739	2.700	3.279
Al_2O_3/Fe_2O_3	2.562	1.605	1.206
$CaO/SiO_2+R_2O_3$	2.054	2.048	2.052

It will be noted that the lime ratio has been held constant, and would seemingly give results of close approximation, when we talk of high and low limed cements; on the other hand when these are calculated to the most probable and important compounds contained in portland cement clinker, these three clinkers are very different in composition.

Referring to the analyses above they show the following major constituents of composition:

	No. 1	No. 2	No. 3
$3CaO \cdot SiO_2$	43.14	49.81	51.97
$2CaO \cdot SiO_2$	27.24	19.17	18.86
$3CaO \cdot Al_2O_3$	20.19	19.37	16.40
$2CaO \cdot Fe_2O_3$	5.06	7.75	8.72

Considering the theory that iron and alumina compounds act only to a greater extent as fluxing agents and that all the strength of the resulting cement comes from the two silica compounds, these analyses would show that the cements made from these three clinkers would have considerable difference in their physical properties.

In as much as to the tri-calcium silicate is attributed the early strength of the cement, the di-calcium silicate being responsible for the gain in strength at the later periods, it seems as though if all phases of manufacture are carried out identically in each case, each of the cements would probably attain approximately the same ultimate strength, probably within one or two years;

*Translation of Cement Analyses to the Various Complex Compounds. By E. L. Drury, ROCK PRODUCTS, September 17, 1927.

Interpreting Cement Analyses. By W. E. Haskel, *Concrete*, August, 1927.

however, cements made from clinkers No. 2 and No. 3 would show considerably more strength at the earlier periods.

In remodeling raw mixes, as was done in the experiments to which I refer, although the lime ratio was kept constant, any change in the ratios of iron and alumina would have considerable and noticeable effect on the ultimate composition and quality of the resulting product. In replacing alumina with iron in the mixture each per cent of alumina decrease and a corresponding iron increase would leave 1.58% of calcium oxide free to combine with the di-calcium silicate to form the higher silicate of lime, and to the fact that iron compounds are better fluxing agents than alumina compounds a mix could be carried with a higher percentage of the calcium silicates, with no danger of failure on the boil test; however, there would be danger of retrogression at the later periods unless utmost care be taken in manufacture in the cases of the higher silicates.

In connection with the above there are several other conditions which would tend to alter the ultimate composition. No doubt in some cases there are small percentages of FeO in the resulting product, also in practically all normal portland cement clinker there will be found a certain percentage of free lime, which should be taken into consideration in the calculations.

Other Considerations

After all other phases of manufacture have been taken care of up to the final grinding of the clinker we still have the action of the gypsum, which has never been satisfactorily explained; however, it is known that its action on different brands has a very marked effect upon the quality of the product.

I do not think the time is far off, and it may be at hand, when mill chemists will have to revert to a more scientific study and more scientific methods of procedure, taking advantage of all information and results by the present day investigators, if standard portland cement is to retain its present day popularity.

Relation Between Stone and Gravel Abrasion Tests

HIGHWAY SPECIFICATIONS for concrete aggregate generally permit the use of both gravel and stone, giving requirements to make them of comparable quality. The percentage of wear in the Deval machine is one of these, but, as gravel is already rounded by natural causes, three times the percentage of wear is allowed to stone to that allowed to gravel.

This relation has been established with little data to justify it. Recently the matter was investigated by the U. S. Bureau of Public Roads and the results are given by an article by D. O. Woolfe, assistant materials engineer of the Bureau, in the September issue of *Public Roads*.

Comparison was made between the percentage of wear found by the standard test, tests on crushed rock and tests on "synthetic gravel." In the standard test the specimens were broken from ledge rock by hand; in the crushed rock test they were picked from commercial crushed stone. The synthetic gravel was made by rattling lumps broken from ledge rock in a brick rattler, used for testing brick, until they were well rounded. This gave two interesting comparisons, because there is a theory that ordinary crushed stone is not so resistant to the wear test as the rock broken by hand from the ledge.

The results obtained bore out none of the usual theories. Crushed rock showed the same or a little greater resistance to wear that the hand-broken rock did. The one to three relation between the rock (tested by the standard test) and the "gravel" was justified by only one specimen. The average wear of the "gravel" was 0.86% of the wear in the standard stone test.

The materials tested were dolomites and limestones from Ohio, West Virginia, New York, Texas and Kansas. They varied widely in physical characteristics, such as hardness, toughness and specific gravity, and apparently were picked to show as wide variations as would be found throughout the country. But the relations mentioned above seemed to be more or less constant, with the exceptions mentioned.

The article says that a comparative test could not be applied to natural gravel, as the pebbles in a sample of natural gravel are not of uniform characteristics as the pieces of these specimens were. Consequently the relations found cannot be applied to natural gravel and crushed stone. The article further says that it seems questionable that the abrasion test is at all suitable to gravel.

Elasticity of Concrete

FOLLOWING THE STUDY of 2200 cores from Maryland highways for strength characteristics, given in *Public Roads* for September, A. N. Johnson, dean of engineering of the University of Maryland, writes of further studies made on 112 cores in the October number of the same magazine. The object of the second investigation was to determine the elastic limit and the modulus of elasticity of the concrete in the cores, and to compare these with the crushing strength.

The studies indicate that concrete always behaves as an elastic material. That is, when a specimen is shortened by compression the shortening proceeds at a regular rate until the elasticity limit is reached, after which the rate of shortening increases. When the shortening is measured at intervals as the load is applied and the measurements plotted, the line is straight and then curved, and the point where the line begins to curve is taken as the elastic limit.

From a study of the curves plotted the average elastic limit was found to lie between 700 and 800 lb. per sqare inch. But it fell as low as 400 lb. in one specimen and reached 2200 lb. in one.

The modulus of elasticity may be defined as "unit stress divided by unit deformation" within the elastic limit. Thus if a bar shortens 1/1000 of its length under a certain force in pounds, the modulus of elasticity would be the number of pounds divided by 1/1000. (The modulus of 1:2:4 concrete is given in some books as 2,000,000 lb. or about 1/15 of that of steel.—Editor.) The 112 cores had an average crushing strength of 3900 lb. and the average modulus of elasticity found was 3,562,000 lb. per square inch. The lowest value of the modulus was 1,200,000 lb. and the highest 5,840,000 lb. The greater number of determinations fell between 2,400,000 lb. and 4,400,000 lb. In general the modulus of elasticity follows the crushing strength, as shown in the table given, but the relation is not very close. A plot of crushing strengths and moduli shows a cloud of dots (strengths) through which the line of the moduli takes a fairly straight course.

Cylinders of limestone, trap, granite and sandstone, all of which were used as aggregates in the cores tested, were tested in the same way as the cores for comparison. The results showed that granite with a crushing strength of about 30,000 lb. had a modulus of elasticity of 8,500,000 lb.; trap rock, crushing strength, 34,700 lb., 12,770,000 lb.; limestone, crushing strength, 6700 lb., 3,870,000 lb.; sandstone, crushing strength, 39,000 lb., 7,000,000 lb. The elastic limit for trap was determined at 12,000 lb. and for limestone 4500 lb. The figures are averages from the table given.

The sandstone curves were *convex* to the horizontal instead of concave, indicating increased resistance as the load was applied. The same curve was given by some quartz gravel concretes.

Trainload Deliveries of Agricultural Limestone Grow in Missouri

AS A RESULT of distribution of 2600 tons of limestone by special train on the Missouri Pacific railroad in central Missouri, plans are being worked out for the securing of a similar distribution in southeast Missouri. So far the Missouri Pacific has handled four trainloads of lime for Missouri farmers.

In this connection an agricultural limestone conference with representatives from the Missouri College of Agriculture, the County Farm Extension Service, Agricultural Limestone Producers and representatives of the Missouri Pacific Railroad Co. was held at Irondale, September 4.

The 2600 tons of limestone which has been distributed in central Missouri is sufficient to cover approximately 1000 acres of farm land. The farmers are applying the limestone at the rate of two to three tons per acre.—*Poplar Bluff* (Mo.) *Bee*.

The Acme, Texas, plant of the Certain-teed Products Corporation

A Recently Built Gypsum Products Plant in the Southwest

Plant of the Certain-teed Products Corporation at Acme, Texas, Is a Steady Producer, Though Far from Any Metropolitan Market

THE GYPSUM plant of the Certain-teed Products Corporation, of New York, at Acme, Texas, makes plaster, wall board and blocks, using both gypsite and rock gypsum as raw materials. The plaster and block operations have been established for some time; the wall board plant was completed late in 1926, and at the time it was built the company also installed a very modern plant for crushing, grinding and calcining gypsum rock which it mines in ground immediately below the plant.

The deposit is very large the company owning 10½ sections of land, most of it gypsum bearing. Enough of it has been carefully prospected by drilling and sampling so that something like a billion tons is estimated to be in reserve. The gypsum rock is of very high grade, running about 99% $CaSO_4 \cdot 2H_2O$ and no anhydrite has been encountered in mining, drilling showing this mineral to lie entirely below the vein that is mined. The gypsite deposit now being worked lies about a half mile from the plant and is connected with the plant by a standard gage track.

Combined with this excellent deposit the company has the advantages of low-price natural gas for fuel, since it is near the great Texas gas belt, sufficient water from the mine, fairly cheap electric power and unusually intelligent labor. All this may explain why a plant so far from large cities is enabled not only to compete with plants nearer markets but to build up a considerable export trade.

Deposit of Interesting Origin

M. L. Tyrrell, the company's mining engineer says that the underground deposit is of Cretaceous origin while the gypsite deposits are much younger, probably upper Pleistocenic. The gypsite was laid down on a surface already eroded and below it have been found some interesting fossils, especially the tusks and teeth of an elpas, the successor of the mastodon. But the geology of the deposits has not been worked out in detail as yet.

The gypsum rock lies in a flat bed, the bottom of which is about 45 ft. below the surface. In the part being mined at present it is 18 ft. thick, although it is somewhat thinner in other places. Above it is 12 to 15 ft. of rock shale and above this are two clay strata, one red and one blue, and at the top is a layer of soil which is largely gypsite, three to four feet in thickness. The shale would serve as a roof, but to insure that only clean gypsum is mixed, 1½-ft. to 2-ft. of gypsum is left above. And for the same reason about a foot is left on the floor.

Mining

The rock is drilled by Jeffrey ⅞-in. auger drills, electrically driven. The room and pillar system is used, the rooms being carried about 30 ft. wide and the pillars left at points of equilateral triangles. In starting to work a face, a cut is made by putting in eight horizontal holes 11 ft. deep, set 45 deg. so that they almost meet. Two of these cuts are prepared and shot, which leaves the face roughly "saw toothed." The points are then shot out by cut holes put in the same way. After this is done the slab left above is shot down by horizontal holes placed at the roof line. Atlas powder of 20% or 30% grade is used and all shots are fired by electricity.

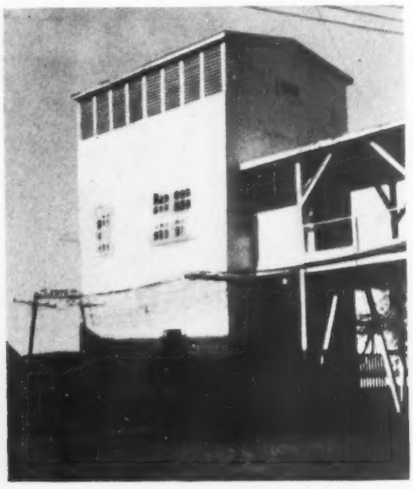
This system brings down the rock in large pieces, many of them too large to load by hand. The big pieces are drilled with a hand drill, electrically driven, which was originally devised for drilling metal. Fitted with a ⅞-in. bit and adapted for drilling rock, it cuts very rapidly, so that only a little work is required to put in the pop shots that break the chunks to one-man-stone size. Loading is done by hand and the cars are drawn to the underground crusher by horses. Horses are found better than mules for the work and they stand it well as they are brought on top every evening. The mine is worked only in the daytime.

This is an exceptionally good mine to work in as the air is always fresh and pure and it is well lighted. The rock is almost snow white which makes the workings as light as well lighted rooms. The men need neither lamps nor candles. Ventilation is easily provided, as it is a simple matter to put a hole through to the surface whenever more air is needed. The only obstacles encountered have been occasional "solution channels" (underground water courses) which are passed with no serious difficulty.

Tractors with trailers working in the gypsite deposit

Loading gypsite to railroad cars with a tractor

The mine makes about 400 gallons of water per min. which is pumped to the surface by two Allis-Chalmers 6-in. pumps, run as needed, and this water is a valuable asset since running streams above ground are not always dependable in the flat prairie country. The only change in the system contemplated is the use of electric mine locomotives in place of horses as the hauls become longer.

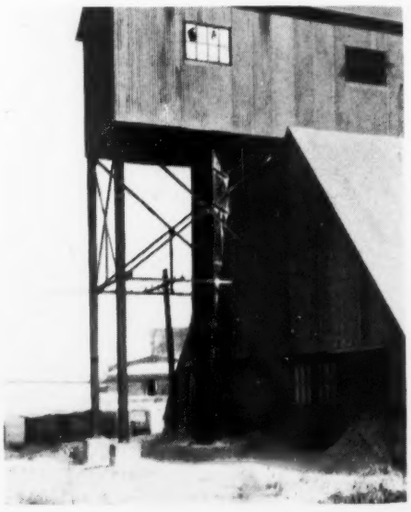


The hoist house, used for lowering men and horses to the gypsum rock mine

Crushing

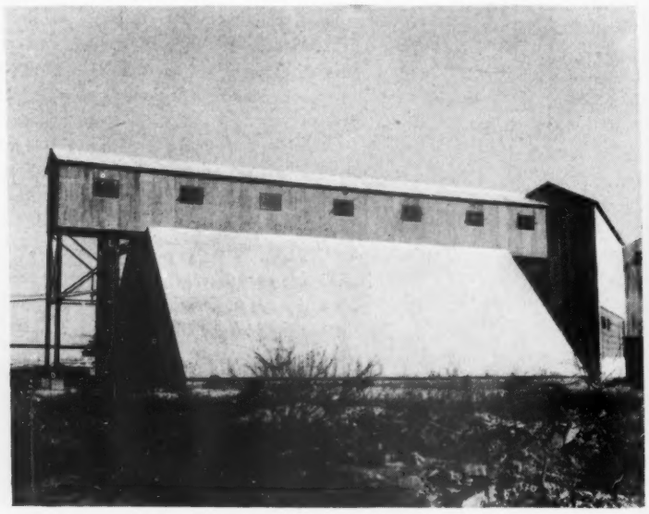
The cars are of the low-side mine type, the greater part of which were built by the company, at the plant. Fully loaded they weigh 5000 lb. and the weight of each is taken on a Howe dial scale at the crusher. Then the car is dumped on a Jeffrey pan conveyor 36 in. wide and 30 ft. long, driven by a 5-hp. motor through a Foote Bros. speed reducer. It falls into the hopper of a Jeffrey hammer mill crusher, rated at 60 tons per hour but able to do more, driven by a 100-hp. Westinghouse motor. There are other motors of the same make in the plant, but there are also motors of General Electric, Allis-Chalmers and Triumph make.

A short Jeffrey drag conveyor driven from the crusher takes the crusher discharge to the boot of a 18-in. bucket elevator which goes through the roof to the surface and to the top of the rock storage house, about 80 ft. in all. This is considered too high (the weight of the rock in transit is nine tons) and it will later be replaced by two 40-ft. elevators. The buckets are on a double chain and a smooth head pulley is employed in the place of sprockets, the weight giving sufficient traction. This elevator is of Stephens-Adamson Manufacturing Co. make as is also the conveying system connected with the rock storage. The elevator is driven through a belt by a 10-hp. motor.



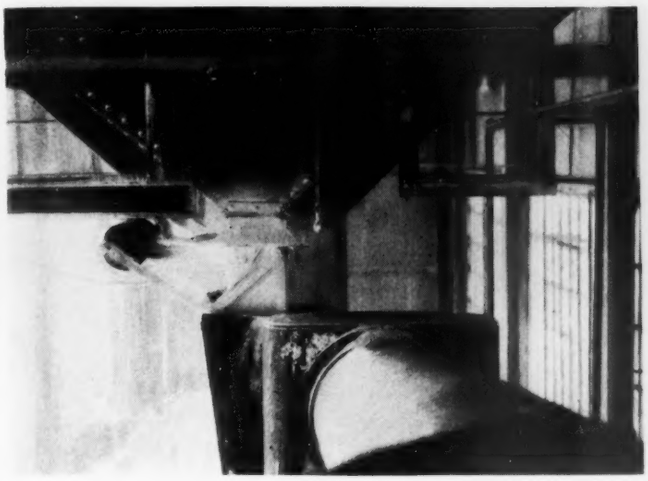
Elevator which lifts the gypsum from the underground crushing plant to the rock storage house

The rock which comes from the mine via, the 80-ft elevator is discharged on a 24-in.

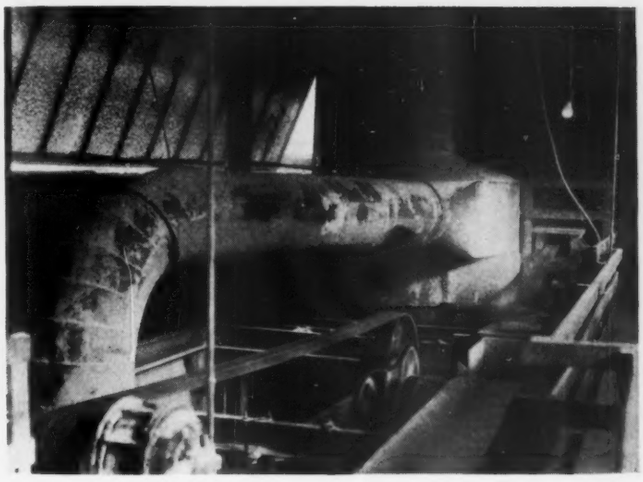


The gypsum rock storage house, with the rock dryer house at the right of the picture

The new calcining plant, and the stucco tanks for the wallboard plant in the left foreground



The dryer bin and feeder



Cyclone and suction pipe connecting it to the dryer feeder

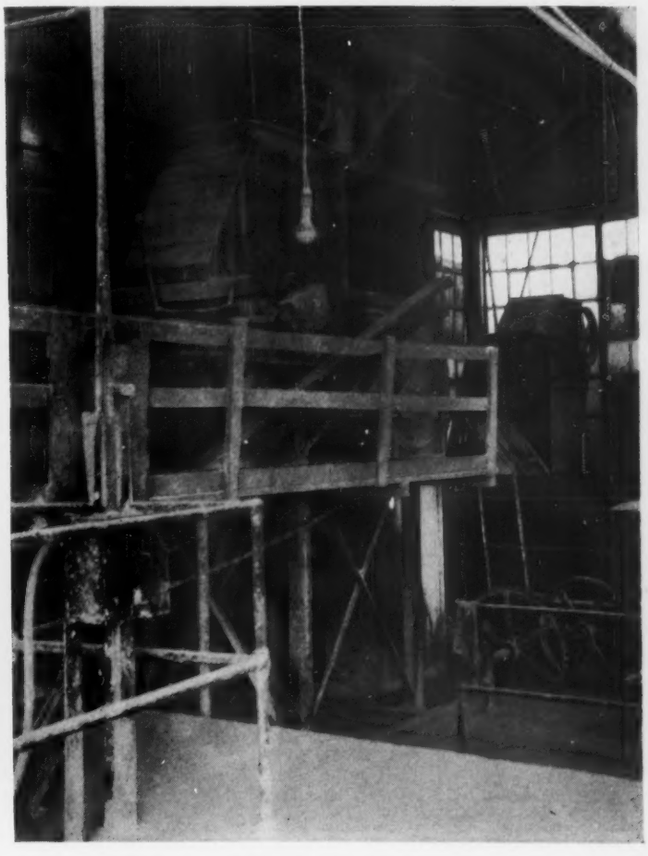
belt lengthwise above the 60 x 80 ft. rock storage house. This is provided with a tripper, which may be cut out so as to send the rock directly to the dryer bin. And a Jeffrey drag chain running in a trough permits the dryer to be by-passed and the rock sent directly to the Raymond mills. This cuts down the capacity of the mills considerably, so it is only used when repairs make it necessary. Provision has also been made to load cars of commercial rock from the overhead belt.

Drying and Pulverizing

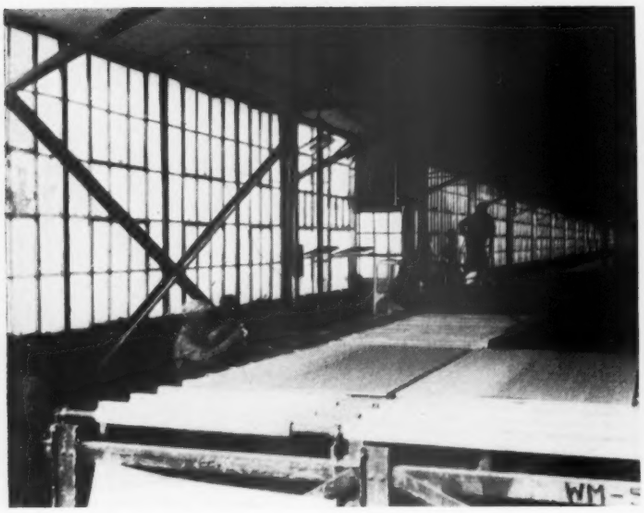
The dryer is of Ruggles-Coles make, 36 ft. long and 60 in. in diameter fired with natural gas. It is fed by an Ehrsam pan feeder and just below the feeder on the pipe, leading to the dryer is a pipe going to a Buffalo Forge Co.'s fan discharging to a 10-ft. cyclone. The dust collected in this cyclone discharges continuously into the elevator, 50 ft. high, that lifts the dryer discharge to the Raymond feed bins. The dryer is direct driven by a 60-hp. electric motor through the usual gear train.

The Raymond feed bin is placed above the mills and holds 250 tons. There are three of these mills, one originally by the high-side type, of 4 rollers, which is driven by a 75-hp. Westinghouse motor through a Link-Belt silent chain. The other two are 5-roller mills and are direct-driven by 75-hp. Allis-Chalmers motors. These mills are provided by the Raymond pneumatic feeding device. Grinding is done in these mills to 80% to 95% through 100 mesh.

Cleaning out under the kettles in the calcining plant



The load of the mixing elevator in the wallboard plant, with the sawdust elevator in the rear



The end of the wallboard machine. The man at the left operating the transfer table

Adjusting the cut-off of the wallboard machine

The regular Raymond air separation system is used with these mills, three fans, each driven by a 40-hp. motor, sending the mill discharge to air separators. The coarse material is sent back for regrinding and the fine falls to a 9-in. screw conveyor that takes it to the kettle bins, which hold about 250 tons together.

Calcining

There are two Ehrsam kettles, 14 ft. in diameter and about 10 ft. from bottom to cover. Sectional bottoms were used but they have been replaced with solid bottoms of pressed steel and this type of bottom has been found very satisfactory, especially when used in connection with gas as a fuel. The kettles are fired with gas and the burners were made by the Webster Engineering Co. The same kind of burner is used for firing the rock dryer and the boilers in the wall board drying plant.

The hot pits which receive the kettle discharge of about 15 tons, are each of 30 tons capacity. They are hoppered and a single screw under each of them conveys the stucco to the hot elevator which has 18-in. buckets and raises the stucco 65 ft. to the stucco bins. The hot pits are connected with the fog box above the kettles. This was not done originally and there was some trouble caused by condensation in the hot pits and the forming of lumps but a pipe to the fog box did away with this.

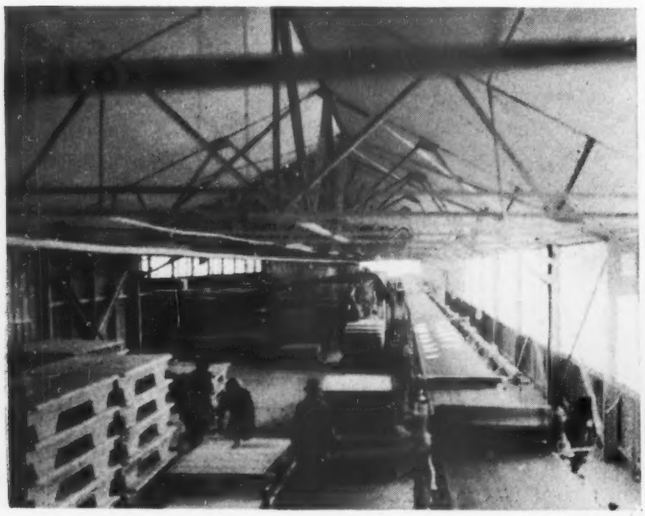
Some engineers claim that the fog box is not needed, but its usefulness is apparent in this plant as it catches about 15 tons of dust daily. This is put into one of the kettles every morning as a sort of priming charge. No trouble has been experienced with condensation in the fog box. Its dimensions are 25 ft. long, 8 ft. wide and 10 ft. deep and it contains two baffles to give an over-and-under flow to the gases. Very little dust can be seen coming from the stacks.

The elevator lifts the stucco to a 150 ton storage from which there are spouts that can discharge to either of these screw conveyors. One takes it to the stucco bins of the wall board plant, one to the white plaster plant and one to the block plant. The greatest distance is about 250 ft. and three screws, all 9 in. diameter, are used for this.

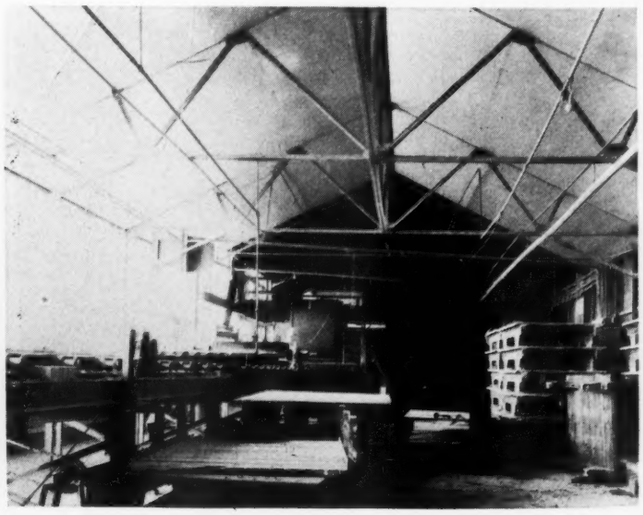
Wallboard Plant

Of these plants only the wall board plant will be described in detail since it is one of the most modern installations in the country, while the others resemble plants that have been often described.

The most striking feature of the wall board plant is that all the machinery is run with variable speed drives. Time is the important factor in the making of the board and the drying that follows and the variable speed allows the time factor to be regulated according to temperature dampness, the characteristics of the materials used and other

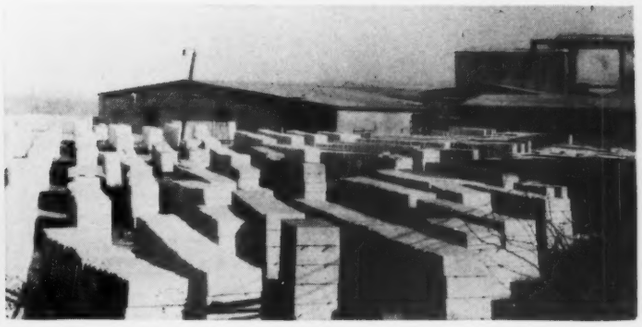


Looking down the belt from the mixer. The ironing roll shows at the right



View toward the feed end of the wallboard machine

General view of the Acme plant of the Certain-teed Products Corporation



Storage yard of the block plant where all the blocks are cured by sun-drying

things that might influence the uniformity of the product. The device by which the speed is regulated is the "Reeves drive," an arrangement of flat cone pulleys and a chain belt, used in many cement plants for regulating the feed to the kilns and for feeding powdered coal to the burners.

The stucco bins at the wallboard plant are steel bins 20 ft. in diameter and about 30 ft. high. They have a ventilating system which avoids condensation. The sawdust bins are 30 ft. in diameter and each holds five carloads, 90 tons. The sawdust is blown into them by a Buffalo Forge Co.'s 30-in. fan. It is unloaded from the car into a track hopper from which it is lifted by a short bucket and belt elevator to a screen over a trough which is connected at the bottom with the fan suction. The excess air escapes from the tanks through an air separator of the cyclone form. This arrangement would be quite satisfactory if the sawdust was clean and uniform, but as it is, it sometimes gives trouble from the amount of coarse material to be handled.

Gates are placed at the bottom of each stucco bin and at the bottom of the sawdust bins to feed on a short conveyor, and by setting these gates the proportions of the mix can be regulated. The *quantity* of dry mix which is fed to the wall board machine is regulated by the speed of the belt and the elevator which receives the belt discharge, the motor operating these being connected through a Reeves variable transmission. The elevator discharges into a kind of hood and at the outlet is a grooved roller which feeds the material on the soaking belt and grooves it so the water can get into it better.

The soaking belt is of the Ehrsam type, and 48 in. wide. The center is depressed to form a pool kept full of water by a "steady head" tank at one side. The mix of sawdust and stucco passes through the pool and afterward to finger mixers, revolving arms that run in overlapping circles to cut and mix the material. There are eight of these arranged in two rows. Adhesives and accelerator (ground gypsum rock) are added at this point. From the end of the soaking belt the material drops in the center of the main belt of the machine, carrying the lower paper, and passes, with the upper paper above, through the forming rolls. There are four belts on the machine, each 125 ft. 9 in. long, making the total length slightly over 500 ft. The speed is in the neighborhood of 45 ft. per minute, but this is governed by a Reeves variable transmission. There is only one ironing roll, and this is set about 40 ft. from the forming rolls and run in the reverse direction to the belt.

Only open edge board is made, which requires trimming. The trimming saws and the cut-off are placed near the end of the belt. The cut-off is of the Ehrsam type, a knife that projects from a roller that revolves above the belt and that travels with it while the cut is being made. The length of the board is regulated by the usual intermittent gears.

After cutting the board is run off on to a transfer table, made by the Coe Manufacturing Co., that takes it at right angles to the live rolls entering the Coe dryer.

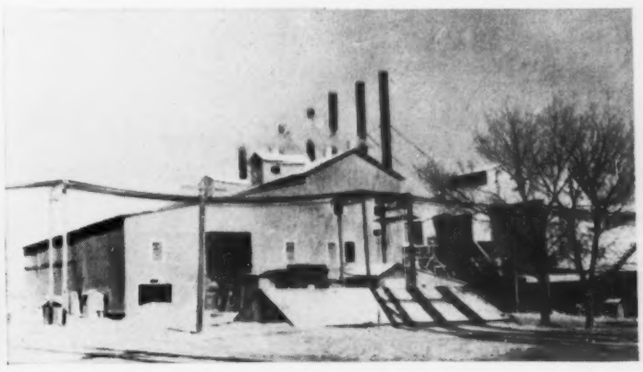
Wallboard Dryer

The dryer is 402 ft. long, the heating section being 271 ft. and the cooling section 132 ft. There are six decks of rollers on which the boards are passed through, the rolls being driven by chains and sprokets, through a Reeves variable transmission so the speed of drying may be regulated. Recording "Tycos" thermometers are placed at four points along the hot section.

The principle of the Coe dryer is the keeping of a body of air in circulation, heating it at each passage through the fan and discarding a varying portion according to the amount of moisture it contains. There are two circulating systems in this dryer, one for the wet and one for the dry end. Each has a fan run by a 50-hp. motor. To withdraw air from the circuit there is one exhaust fan driven by one 30-hp. motor. The amount of air taken out is regulated by opening and closing dampers in the suction of the exhaust fan. The temperature at the wet end sometimes reaches 300-deg. F.

The air is heated by steam coils before it goes into the dryer and by steam coils in the dryer and the steam comes from two John O'Brien boilers of the vertical tube type. They are fired with natural gas through Webster burners. As the mine water is saturated with gypsum it is evaporated in two Croll-Reynolds evaporators before being

The back side of the plant, with the boiler house for the dryer in center. The whole building is about 600 ft. long



The brown plaster plant which uses gypsite as its raw material

sent to the boiler, but as all condensed steam is returned only the water needed to make up losses has to be evaporated. The boilers and evaporators are housed in a separate building.

The rating of this machine is 250,000 sq. ft. per day, but it can be pushed beyond that capacity. All boards are made 48-in. wide but both ⅜-in. and ¼-in. boards are made, the thinner board being demanded by export trade and the Pacific coast market.

Block and Plaster Departments

The other departments fed from the calcining plant are the block plant and white plaster plant. The block plant uses a very simple machine invented by Harry E. Pipe, a former employe of the company. It consists of a box built up of movable separators, and a device for running the cores in and out, which is filled from a traveling mixer running above on rails. Three of these machines are filled in turn, each holding 16 3-in. or 12 4-in. blocks. All blocks are dried in the open.

The white plaster department has the usual mixing and bagging machinery and also contains a Munson Bros. burr mill for grinding molding plaster. Experiments with ball mill grinding have been tried but so far they have not succeeded in producing so satisfactory a product as that made by the burr mill.

Gypsite for the brown plaster mills is dug by Western wheeled-scrapers pulled by Fordson tractors. These discharge on the end of an inclined elevator which overhangs a railroad car. It is intended to use a dragline excavator in the place of these scrapers a little later. The brown plaster mill uses the customary process of calcining gypsum. The plaster is mixed in Broughton mixers and sacked in Bates valve bag packers.

The company buys most of its electric power but makes a portion in a power plant containing three Busch-Sulzer Diesel engines direct connected to generators made by the Electric Machinery Co.

The offices of the Certain-teed Products Corp. are at 100 East 42nd Street, New York. Charles Vestal is plant superintendent and Roy Depper is his assistant.

Device Measures Consistency

THE BUREAU OF STANDARDS announces development of an improved instrument for measuring the consistency of a plastic or "mush" material.

The new device is known as a multiple-bulb consistometer, and permits making the necessary measurements in a single run without refilling, instead of a series of separate runs.

In measuring the consistency of plastic materials the relation must be found between the rate of flow and the applied pressure. Since the rate of flow is now proportional to the pressure, it is necessary to make successively observations at different rates of flow. With most of the instruments previously used, this necessitated making one run for each observation, but with the six measuring bulbs of the multiple-bulb consistometer, six separate observations may be made on a single run, and thus adequate information may be obtained for determining the rate of flow which will be produced by any given pressure.

Zonolite Products' Patent Is Upheld

PATENT No. 1693015 was granted November 27, 1928, to Joseph A. Babor and William L. Estabrooke, for bricks, slabs, and other molded articles, and method of making the same, on application No. 685105, filed January 9, 1924.

The denial of claims by the primary examiners-in-chief was reversed by the first assistant commissioner, who found that the molded article comprising exfoliated zonolite and a binder of water glass, as well as the process of making the article, constituted a discovery of commercial value entitled to a patent.

The full text of the opinion of First Assistant Commissioner Kinnan follows:

Applicants have appealed from the decision of the examiners-in-chief affirming that of the primary examiner denying patentability to all the claims, six in number, of which claim one will serve for illustrative purposes:

"1. A molded article comprising exfoliated zonolite and a binder of water glass."

The references relied upon are: Senn et al., 930801, Aug. 10, 1909; Mitchell, 774-946, Nov. 15, 1904; Strickler, 835142, Nov. 6, 1906; Aylsworth, 1102633, July 7, 1924; Dana's System of Mineralogy, pp. 493-494.

Uses of Product Stated

The claims are directed to a molded article and to the process of making it, which article comprises a substance found in nature and known as zonolite, also called vermiculite, which is combined with a binder, specifically water glass. The article is stated to be useful as a brick, a slab, a heat-insulating and fire-resisting device and to possess considerable strength with reference to both compression and tensile strains. It is described as being light in weight and a good substitute for the common wall board used to form partitions, walls, ceilings, etc. The material is heated to produce the desired exfoliation and the resulting porosity renders it capable of being mixed with a solution of water glass after which mixing the product is molded in the desired shape and the water is driven off.

The publication "Dana's System of Mineralogy" refers to this substance under the name "vermiculite" and states that it "occurs in small foliated scales, distributed through a steatitic base, and hence scaly-massive." This publication further states that "Crossley separated with great care from the base the scaly mineral which is the true vermiculite. When heated exfoliates prodigiously, the scales opening out into long, worm-like threads, made up of the separate folia. Exfoliation commences at 500 deg. to 600 deg. F., and takes place with so much force as often to break the test tube containing the mineral."

Prior Art Reviewed

From the foregoing it will be noted that that basic material used by applicants was previously well known to possess the property of ready exfoliation under the influence of heat. This publication discloses no particular use for the material nor does it disclose the mixing of the material with any binder. The patent to Senn and Kluger discloses a method of manufacturing a porous material which may be used for some of the purposes contemplated by the applicants. This patented process includes heating a mica-slate, argillaceous slate, coal slate and the like, to a suitable temperature, which results in a considerable increase in the volume of the material. The patent does not disclose the applicants' method of treating the material by mixing therewith a binder. The patent to Mitchell discloses a micaceous material mixed with a fusible silicious binding agent, silicate of soda being noted as one binding agent to be used, and thereafter the mixture is molded to shape and dried, and may be used for many of the purposes for which the material is used.

The foregoing indicates substantially the prior art. It was the view of the examiner and of the board of examiners-in-chief that with this disclosure there was nothing inventive in the discovery that zonolite, sometimes called vermiculite, could be heated until it had exfoliated, then be mixed with a suitable binder and the resultant material molded into form to produce the article set forth in the application. There is nothing, however, in the prior art to suggest that this particular material possesses the peculiarly advantageous properties claimed for it by the appellants. All that was known, so far as the references cited reveal, was that zonolite when heated would exfoliate and increase in size. There does not appear to have been any previous knowledge of the properties it possessed, much less that it possessed, when mixed with a suitable binder, the desirable properties discovered for it by the applicants. It would appear, in consequence, that the applicants discovered useful properties for the mixture, and an efficient commercial article resulted from such discovery. It would seem the protection of the patent law should not be denied a meritorious discovery of this character. The product and the process of making it are admittedly new and it is deemed the claims are patentable.

The decision of the examiners-in-chief is reversed.

A Modern Lime Plant Laboratory

Of Kelley Island Lime and Transport Company

LIME is one of the most important materials used in the chemical industry, yet its manufacture and use is less closely controlled by analysis than almost any other chemical. One reason for this is probably due to the lack of satisfactory rapid methods for most of the determinations required. Lime companies equipped with a private laboratory for the control of their products are comparatively few. Of these the Kelley Island Lime and Transport Co., of Cleveland, Ohio, probably has one of the most modern and elaborate outlays for this kind of work in the country. The laboratory is situated at their White Rock, Ohio, plant and is under the capable supervision of R. G. Greeves, a member of the lime committee of the American Society for Testing Materials, and formerly associated with the Bureau of Standards at Washington. Mr. Greeves is assisted by R. O. Spaulding, W. W. Hunlock and L. W. Tillotson.

The laboratory building, formerly the plant hospital, a modern one-story stucco structure, standing apart from the lime plant proper, and is so situated that the prevailing winds do not carry the dust and smoke of the mill and kilns toward the building. A few years ago the laboratory was in the rear of the office building and occupied much less space. Since then, however, the company has found such advantages in analytical control of its product that the present building was taken over in order to handle the increasing work being sent through the department.

Laboratory Equipment

The new laboratory consists of two large main rooms, a balance room, wash room and entrance hallway. Both main rooms contain large wooden surfaced chemical tables having a one-tier reagent shelf in the center. Most of the routine tests are made in one room of the building in which there is a natural draft hood. Electrical heating equipment is resorted to, as gas is not available for laboratory use. Three Hoskins electric mufflers, one Type F. D.-101 and two Type F. D.-202, two Hoskins (12x18-in.) hot plates and an E. H. Sargent and Co. size (12x10x9-in.) constant temperature oven compose part of the electrical heating equipment. For the calorimetric determination of coal a Parr oxygen bomb calorimeter and a Beckmann differential thermometer are used. For accurate weighing in analytical work the laboratory is equipped with a Christian-Becker balance and a Becker's Sons-Rotterdam Brummen balance, each sensitive to 1/20 milligram. Water supply is furnished by the plant-pumping system. Distilled water is purchased.

Routine Tests

The old laboratory quarters are still in use and a special routine rate of settling test is performed there. By means of this test, which was developed in the laboratory it is possible to tell almost instantly if anything goes wrong at the plant.

Limestone, quicklime and hydrated lime are analyzed for silica and insoluble matter, loss on ignition test, iron and alumina content, calcium, magnesium, sulfuric anhydride, phosphorus, mangenese, available lime and carbon dioxide, the latter test not being a part of the routine but run occasionally. These analyses are run according to methods approved by the American Society for Testing Materials.

An important test is that for the soundness of lime. By an unsound lime is meant a lime which, at some time after being used, undergoes a change leading to its weakening or eruption. The first step of the test consists of making a lime putty and gaging it with plaster of paris to prevent its cracking upon setting. The putty is then shaped into uniform patties and allowed to set. After the set has taken place the patty is put into a steam bath and allowed to remain there for a period of five hours. If any unsound material is present, the surface of the putty will be disturbed, thus disclosing in a matter of a few hours what might happen over a period of six months.

Beside the regular control analysis for the White Rock plant, the laboratory performs the routine tests for all of the company's plants. Miscellaneous tests for specific uses of material in particular industrial requirements are performed along with the regular routine work. For example, a glass manufacturer requires a lime with a low loss on ignition; steel plants, requiring a fine crushed stone, are particularly interested in the phosphorus and sulfur content.

Sampling

The methods employed in sampling deserve considerable attention, for the results of a most exacting chemical analysis would be of little worth if non-representative samples were examined. Samples of the finished hydrate are taken every one-half hour from the bagging machine. Ground lime samples are taken while the car is being loaded from a chute. In sampling coal at the White Rock plant, a sampling tube is used which procures a representative sample from top to bottom of the car. In sampling coal at the other plants the work is done by the men at the particular plants. Enough shovelfuls (approximately 100) are taken to give a representative sample. This is broken down to pass a 1-in. ring, quartered, and a 5-lb. test sample sent to the laboratory.

In sampling other materials such as stone from the quarry face or from carloads, it is left to the judgment of the men taking the samples and is dependent upon what they are particularly interested in, as, for instance, an average sample, or a particular product in question. For grinding the laboratory samples the material is first put through a chipmunk crusher, then a planetary disc pulverizer and, lastly, a pebble mill.

Laboratory staff of the Kelley Island Lime and Transport Co., White Rock, Ohio

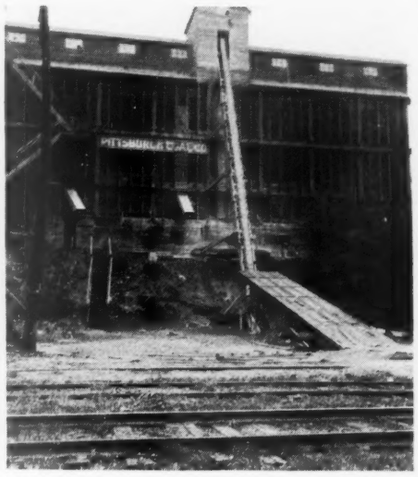
Hints and Helps for Superintendents

Novel Method of Moving Shuttle Conveyor

THE Duluth Crushed Stone Co., Duluth, Minn., recently acquired the old coal bunkers of the Pittsburg Coal Co. and are now using these bunkers as a distributing center for their products in downtown Duluth. The crushed and sized rock is hauled from the crushing plant in standard gage, bottom-dump railroad cars and is dumped into a small track hopper. This hopper will not hold a full carload, but is so built and used that the car itself acts as the storage hopper that feeds an 18-in. inclined belt elevator, driven by a 5-hp. motor. This short, inclined conveyor discharges to an open, 16-in. bucket elevator and elevates the rock to the top of the bunkers, where the rock discharges to a shuttle conveyor.

The shuttle conveyor is particularly interesting in its arrangement. It is about 40 ft. long and is equal in length to half the total length of the bins. The 16-in. conveyor belt with its 5-hp. motor, the necessary head and tail pulleys, and the carrier rolls are mounted on a wood frame which is carried by flanged wheels riding a 36-in. gage industrial track. The tail pulley shaft is extended out and beyond the frame of the conveyor, and on this shaft extension is keyed a gypsy head.

When it is desired to move this conveyor, one end of a rope is fastened to a wall timber and the other passed over the capstan and the whole conveyor shifted by winding the rope on the drum with the power supplied from the motor that is directly connected to the conveyor.

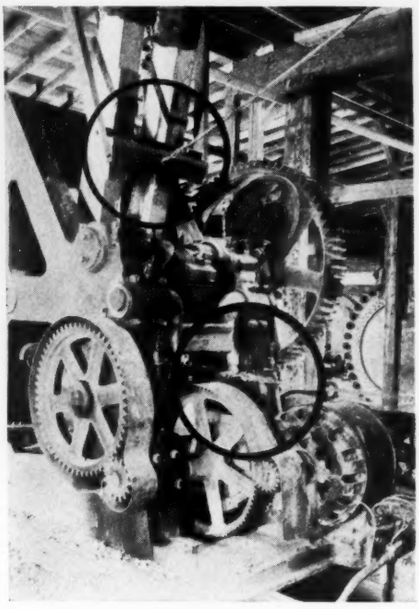


Coal bunkers used for distribution of trap rock. Part of track hopper at right foreground

A Bumper for Non-Flowing Sand-Lime Mixtures

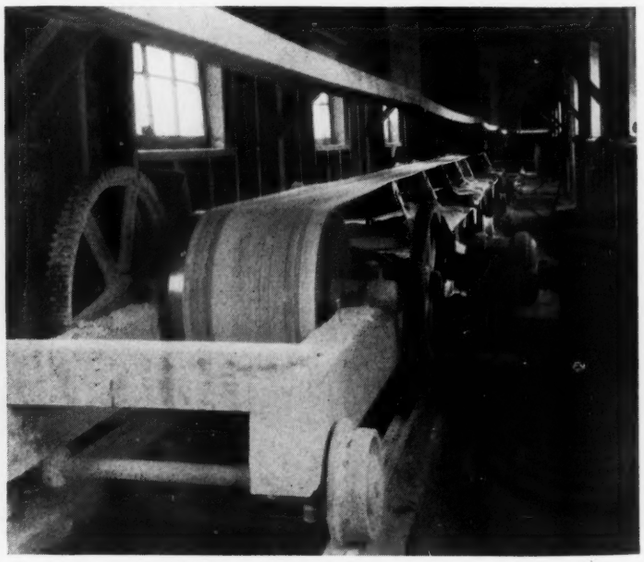
THE damp mixture of sand and lime that is used to make sand-lime bricks is not a free running product and when passed through a chute of small size it is very apt to clog and, hence, some means must be devised to keep the material flowing steadily.

At the plant of the Alsip Brick, Tile & Lumber Co., Ltd., Winnepeg, Manitoba, two Berg presses are used to form the bricks. The sand-lime mixture is fed to each press through two sheet iron, enclosed spouts that are lagged with pieces of light lumber so as not to become dented when bumped by the type of hammer shown in the cut. The bumper is supported from a suitable hinge at the ceiling and is operated by means of a rope attached to a toggle arm that is part of the brick forming mechanism. This rope passes over two small sheaves and back to the bumper. By this device a steady flow of sand-lime brick is delivered to the presses.



The bumper can be seen in the upper circle and in the lower the cam for its operation

Capstan on extended shaft of tail pulley and rope used for shifting shuttle conveyor



The motor for driving shuttle conveyor at the Duluth Crushed Stone Co.'s downtown yard

Load of limestone as it descends to kilns will pull up the empty car

Type of steel body dump carts for hauling limestone at High Cliff, Wis.

Balanced Skip Hoist at a Bluff Quarry

THE Western Lime and Cement Co., with head offices in Milwaukee, Wis., operates a large number of plants in that state. At High Cliff, Wis., the stone is quarried from a bluff overlooking Lake Winnebago and at considerable elevation above the kilns and crushing plant.

The operation of this plant has been continuous for more than half a century and the quarry has been extended back from the edge of the bluff for a considerable distance, leaving a remarkable smooth and level quarry floor. The stone is hauled by teams in dump carts of the type shown in the cut, where they are dumped to the inclined skips. There are two of these inclined skip tracks running almost at right angles to each other, one serving the crushed stone plant and the other the lime kilns.

The skips each hold a wagon-load of material, and when loaded are lowered by gravity to the respective plants below. The track down to either of the plants consists of a single industrial track, with a bypass halfway down the hill so that the up-coming empty car can pass the loaded car at that point. The empty car is pulled up the hill by the descending load, the cables of the respective cars back-winding over a long single drum placed at the top of the grade. The cable for one car takes off from one end of this drum at its upper side, and the cable for the other car which is traveling in the opposite direction takes off from the other end of the drum at its lower side. The drum speed is controlled by a suitable brake band and shot attached to its shaft, which is extended at one end.

Blasting Huts on the Missaba Range

THE iron ore, hematite, is used as a source of iron and steel and this mineral will account for at least 90% of the iron produced in the United States. This production is mainly from the Lake Superior and Birmingham, Ala., districts.

A small part of the iron ore produced in the Lake Superior district is gained by underground methods but by far the largest tonnage is taken from open pit mines or quarries.

As one stands on the brink of the mammoth pit of the Hull-Rust-Mahoning mines of the Oliver Mining Co. at Hibbing, Minn., where are located the largest open pit iron mines in the world, one can see scattered over the floor of the pit at least a half dozen neatly built circular huts that are used to protect the pit men during blasting operations.

The huts are 8 ft. high by 8 ft. in diameter, are made of steel plate and are provided with a conical roof. At the apex of the roof is welded a large ring and when it is desired to move the shelter to a more convenient spot one of the many shovels in the pit, by means of a sling, hooks onto the ring and moves the shed to its new location. The huts are all painted yellow and are easily seen from a distance against the dark red background of the hematite ore beds.

A neat and practical blasting hut as used in iron mining pits on the Missaba Range, near Hibbing, Minn.

Piecework and Scales in a Small Quarry

WHERE rock is loaded in a quarry on a contract basis, the installation of a set of scales may provide some interesting information and possibly reduce operating costs.

At one quarry recently visited the rock was loaded by hand on the contract basis, 60 cents per 2½ yd., or 24 cents per yard, which was the price usually paid for this work in quarries in that vicinity, and which includes delivery of the rock to the scales and to the foot of the incline.

There were six tracks, two men per track, and the cars when loaded were pushed to the home-made turn table, from which the rock passes over the scales and were then hoisted up the incline. Previous to installing the scales, the rock was paid for on a per car basis, and after the first month's operation by the new procedure it was found that the month's production was greater than the previous month's, and $500 in labor had been saved in addition. As the quarry has been in operation 75 years, we are wondering how the old bank account would have stood if scales had been adopted in those "good old days."

Marquette Cement Will Use Pump Boats for Bulk Shipments to Memphis

ANNOUNCEMENT has been made by the Marquette Cement Manufacturing Co. of the completion of plans for the inauguration of a barge line between Cape Girardeau, Mo., and Memphis, Tenn., to be utilized for the transportation of bulk portland cement from its plant at Cape Girardeau to storage silos in Memphis, where it will be packed in bags for reshipment for local consumption. A movement of 250,000 bbl. in a ten-month period is contemplated.

The necessary docks and trackage have already been built at Cape Giradeau. The packing plant at Memphis will consist of a series of reinforced-concrete silos 60 ft. high and several units of Bates valve-bag packers, together with elevators, chutes and belt conveyors. The Memphis terminal will be located on the Wolf River canal, in which dredging operations are now in progress. The canal will have a maintained bottom width of 200 ft. at the mouth and as far north as Auction St. and a maintained depth of 9 ft. of water at all times.

An all-steel twin-screw Diesel-propelled towboat has been designed capable of developing 720 hp. The design was made by T. R. Tarn, naval architect, 18 Fancourt St., Pittsburgh, Penn. The barges, also designed by Mr. Tarn, will be 175 x 35 x 8 ft. and the exterior appearance will be that of a standard river barge with a low deck housing. However, within the deck housing and extending down into the hull are located three longitudinal hopper-bottom bins. Beneath each bin and running the length of the barge is a 12-in. screw conveyor, and between the screw conveyors and the bins will be located the gates or slides for controlling the flow of cement. The three longitudinal conveyors will discharge into a cross-conveyor, which in turn will discharge at one point into a Fuller-Kinyon pump, which will transport the cement through a 5-in. pipe line out of the barge through a flexible hose connection between barge and land and through a similar 5-in. pipe into the storage silos at the terminal. All seams and joints of the barge hoppers will be welded.

The Marquette company officials expect to let contracts for the construction of the towboat, barges and terminal about February 1.

Florida Cement Fills Panama Canal Order

THE FIRST BIG ORDER for cement to be shipped to a foreign port by the Florida Portland Cement Co.'s Tampa plant was loaded into the holds of a freighter at the Union Terminal January 7, destined for government use at the Panama canal, according to announcement made by Frank Traynor, sales manager for the corporation.

Having been successful bidder on a 20,000-bbl. order, the local concern shipped the first half January 7, and a second cargo of the same size some time in March.—*Tampa* (Fla.) *Times.*

Otto Kuehne, Jr., Made President of Missouri Valley Gravel Association

THE January 5 issue of ROCK PRODUCTS stated, in the account of the annual meeting of the Missouri Valley Sand and Gravel Association, that Otto Kuehne, Jr., was elected to head the association. The accompanying cut shows the new president, who is also general manager of the Kansas Sand Co., of Topeka, and has been active in the gravel business in that territory for a number of years.

Otto Kuehne, Jr.

Southern Cement Industry Hard Hit by Imports During 1928

IN A SIGNED ARTICLE in the *Birmingham* (Ala.) *News,* Sunday, January 6, J. W. Johnston, vice-president and manager of the Alabama Portland Cement Co., gives the following facts in regard to the effect of cement imports on Southern manufacturers, during the past year:

"Alabama's six portland cement mills shipped during 1928 about 68% of rated capacity to produce. Total shipments by all American manufacturers during the same period were approximately 73% of production capacity.

"Based on several factors known by cement makers to have direct bearing on their trade outlook, the year ahead is thought to hold local promise of fairly steady demand. At the turn of the year further industrial development in the local district appears to have taken on an aspect of assured progress.

"This should be true especially of the new year's later months, when highway, bridge and street paving construction programs are advanced to full swing schedules in Alabama and nearby states. Ever-increasing insistence for more, as well as better and safer, highways finds state and county highway officials planning the construction of needed improvements in substantial volume. Other construction work of public nature such as grade crossing eliminations, viaducts, buildings and the like, are projected for completion or advancement during the year. United States government engineers are already beginning to order cement and other materials of local production for volume use on flood control works along the lower Mississippi.

Tariff Revision Needed

"If needed tariff revision is not delayed by Congress until too late in the year, the cement mills in Alabama are looking forward to re-entry during 1929 into many of the Atlantic seaboard and gulf coast markets in which for the past four years cement of foreign manufacture has practically replaced the domestic product. Unchecked by appropriate, reasonable, and prompt tariff measures, the menace of further inroads by the increasing flood of cheaply made duty-free cement importation is viewed by local cement makers with serious apprehension."

New Orleans Company Building New Plant

A GRAVEL PLANT to cost approximately $150,000 when fully equipped is in process of installation by the Coastal Construction Co. on Bayou Bernard in Handsboro, La., four miles east of here, where an 80-ft. stratum of gravel is said to lie in the basin of a small lake owned by the Stewart interests. The construction company is dredging with a suction dredge fitted with a 10-in discharge pipe, and expects to move the gravel to market by barge.—*New Orleans* (La.) *Times-Picayune.*

Kentucky Consolidated Stone Company Goes in Sand and Gravel Business

THE Ohio River Sand and Gravel Co., Paducah, Ky., one of the largest operators of its kind on the lower Ohio river, has been sold by its owner, Capt. Robert H. Nobel, of Paducah, to the Kentucky Consolidated Stone Co., of Louisville, Ky. The price was not made public, but it reported to have been more than $100,000. A. J. Hoffman, president of the Louisville company, said the Paducah plant will be an important unit of a great consolidation affecting several large sand, gravel and rock crushing plants located in Kentucky, Missouri, Tennessee, Mississippi and Arkansas.

Editorial Comment

We are entering a period of American business where one of the biggest problems is the preservation of the independent business man. We have all read and heard a great deal about stabilization of business, of profits, of prices, and the means of accomplishing these cherished objectives through mergers and consolidations. This is the day of the chain store, of huge combinations of producing units, of huge aggregations of capital generally. The people who own these great organizations and plants, in the last analysis, are the small, unorganized investors. The people who dictate the policies of these great organizations are generally investment bankers, trust company officials, etc., who are more or less professional directors, with many diverse and often interlocking interests. The people who manage these organizations and plants are largely salaried men—employes.

Large vs. Small Operators

There are many advantages in such ownership and management. It is bound to result in better stabilization of business. It is likely to result in better management, or at least in broader-gage management. It may result in many economies of production and distribution. However, from statistics that have been published from time to time such large organizations do not result in greater profits—that is greater returns on the money actually invested in them. Instance after instance has been quoted to prove that the average consolidated earnings of merged companies have not equalled the sum of the average earnings of the former independent, merged concerns.

In other words, in spite of the possibility of employing high salaried executives and managers, there is still no surer way of insuring efficient, economical management than owner management. And there are many other advantages in owner management through the possibility of giving customers personal attention and personal services which cannot ordinarily be given in a huge organization more or less bound up by certain rules and regulations—red tape—which only the top executives, whom the ordinary customer seldom reaches, have the authority to break.

Most authorities agree that our supremacy in the business world is the direct result of our American characteristics of independence, individualism and freedom of opportunity. Like all other virtues these can be carried so far as to become little short of vices. They may be carried so far that our vast business structure is in danger of dire calamity, as some would have us believe it is at the present time.

Of course, as one prominent producer in our industries has aptly said, the day has gone when any producer or business man can do as he pleases, without regard to his competitors, his industry and the public. On the other hand the day has not yet arrived, in our opinion, when the only solutions of present business competitive problems are through mergers and public ownership.

Our rock products industries have always been intensely individualistic industries. Until very recently neither bankers nor the general public took much interest in them, or even knew of their existence. They are still very largely owned and managed by real proprietors. For that reason they probably have had more severe competitive conditions than some others, and will continue to have competitive conditions that present hard problems, because so many heads must be made to comprehend them, and to help in their solution. But because the old adage "that many heads are better than one" has never been known to fail, in the long run, the ultimate solution of the problem is likely to be a sounder one on that account.

We do not want to become a nation of employes; because if we do we will some day have an administration of our government enterprising or grasping enough to make us all employes of the government. Public ownership of business, carried out to its logical conclusion, is a form of socialism; and the day will come when demigods and politicians will easily convince the mob that their enterprises are safer in the hands of the government.

Annual Index

WITH THIS ISSUE of Rock Products is mailed as Part II an index for the year 1928—Volume XXXI of Rock Products. Many of our readers now bind their full year's issues as a book of reference. Whether they do or not the separately-bound index will be found helpful.

Most of the editorial material in Rock Products is from original sources. But one of the aims of the editorial staff is to make the paper so complete that there will be reference to, or abstracts from, every article or book containing data or information on the rock products industry, from all sources foreign as well as American.

The editors realize that the time of busy executives is something that must be competed for, and that only quality, completeness, accuracy and comprehensiveness will make our paper welcome and acceptable. Rock Products has been often described as "an encyclopedia" of the rock products industry. We aim to make it so, and a newspaper at the same time. We aim to make it so complete and comprehensive that the busy executive may justly feel that when he has perused it thoroughly he need not go elsewhere for any information relative to his industry, or helpful to him, in technical problems, at least.

To get the maximum benefit from Rock Products it is therefore desirable that the subscriber save and bind the 26 consecutive issues each year, for many articles that may be of only passing interest at the moment may be worth many times the price of the magazine at some later time, when an operator is faced with a difficult problem.—The Editors.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	1-16-29	90	.....	
Alpha P. C. new com.	1-14-29	52	55	75c qu. Jan. 15
Alpha P. C. pfd.[2]	1-14-29	116	.....	
American Aggregates com.	1-16-29	50	54	75c qu. Dec. 1
Amer. Aggregate 6's, bonds	1-16-29	114	116	
American Brick Co.	1-14-29	.....	19½	25c qu. Feb. 1
American Brick Co. pfd.	1-14-29	89	94	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]	1-16-29	100	102	
American Silica Corp. 6½'s	1-16-29	96	100	
Arundel Corp. new com.	1-15-29	43	.....	50c qu. Jan. 2
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	1-16-29	90	92	
Atlas P. C. com.	1-14-29	51½	53½	50c qu. Dec. 1
Atlas P. C. pfd.	1-14-29	52	60	66⅔c qu. Jan. 2
Beaver P. C. 1st 7's[30]	12-27-28	99	100	
Bessemer L. & C. Class A[4]	1-11-29	35½	36¾	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	1-11-29	99¾	100¼	
Bloomington Limestone 6's[29]	1-16-29	93	95	
Boston S. & G. com.¶[16]	12-15-28	80	85	$1 qu. July 2
Boston S. & G. 7% pfd.¶[16]	12-15-28	85	90	1¾% qu. July 2
Boston S. & G. 1st pfd.[16]	Called Jan. 1 at 107½			2% qu. July 2
Canada Cem. com.[48]	1-14-29	31½	32	
Canada Cement pfd.[48]	1-14-29	98	99	1.62½ qu. Dec. 31
Canada Cement 5½'s	1-11-29	101¼	102	
Canada Cr. St. Corp. 1st 6½'s	1-11-29	.....	96	
Canada Gyp. & Alabastine	1-14-29	95	98	75c Jan. 2
Certainteed Prod. com.	1-15-29	25¼	26	$1 qu. Oct. 1
Certainteed Prod. pfd.	1-15-29	80½	82	1.75 qu. Jan. 1
Cleveland Stone new st'k	1-15-29	59	63	50c qu. March 1
Columbia S. & G. pfd.	1-14-29	92	93½	
Consol. Cement 1st 6½'s, A[42]	1-16-29	93	96	
Consol. Cement 6½% notes	1-16-29	92	96	
Consol. Cement pfd.[20]	1-16-29	50	60	
Consol. S. & G. com. (Canada)	1-11-29	17	20	
Consol. S. & G. pfd. (Canada)	1-11-29	90	92	1¾% qu. Nov. 15
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	1-11-29	98	99½	
Coosa P. C. 1st 6's[29]	1-16-29	50	55	
Coplay Cem. Mfg. 1st 6's[40]	1-14-29	90	.....	
Coplay Cem. Mfg. com.[40]	1-14-29	15	.....	
Coplay Cem. Mfg. pfd.[40]	1-14-29	75	.....	
Dewey P. C. 6's[30]	1-16-29	99	102	
Dolese & Shepard[7]	1-16-29	120	125	$2 qu. Jan. 1
Edison P. C. com.[19]	1-14-29	50c	.....	
Edison P. C. pfd.[19]	1-14-29	1	.....	
Edison P. C. bonds[19]	1-14-29	75	.....	
Giant P. C. com.	1-14-29	25	35	
Giant P. C. pfd.	1-14-29	30	40	3½% Dec. 15
Ideal Cement, new com.	1-12-29	82	85	75c qu. Jan. 2 & 50 ex. Dec. 22
Ideal Cement 5's, 1943	1-12-29	108	112	
Indiana Limestone 6's	1-15-29	90½	92	
International Cem. com.	1-15-29	90¼	90¾	$1 qu. Dec. 28
International Cem. bonds 5's	1-15-29	110½	110⅞	Semi-ann. int. payable June 15
Iron City S. & G. bonds 6's[40]	1-11-29	97	99	
Kelley Is. L. & T. new st'k	1-15-29	58	59½	62½c qu. & 50c ex. Jan. 2
Ky. Cons. Stone Co. com.[48]	1-10-29	13	15	
Ky. Cons. St. com. Voting Trust Certif.[48]	1-10-29	13	15	
Ky. Cons. Stone 6½'s*[48]	1-10-29	97	100	
Ky. Cons. St. Trustee Certif.[48] (1 sh. 7% cum. pfd. & 1 sh. com. stock)	1-10-29	99½	102	1.75 Nov. 1
Keystone Sand & Sup. 6's[47]	8-22-28	99	100	
Lawrence P. C.[2]	1-14-29	96	100	2% qu. Sept. 29
Lawrence P. C. 5½'s, 1942	12- 7-28	95	97	
Lehigh P. C.[2]	1-15-29	60¾	61½	62½c qu. Feb. 1
Lehigh P. C. pfd.[2]	1-14-29	109	110	1¾% qu. Jan. 1
Lyman-Richey 1st 6's, 1932[18]	1-11-29	99	100	
Lyman-Richey 1st 6's, 1935[18]	1-11-29	98	99	
Marblehead Lime 1st 7's[14]	1-11-29	103	105	
Marbleh'd Lime 5½'s, notes[14]	1-11-29	99	100	
Material Service Corp.	1-15-29	37	37¼	
Mich. L. & C. com.[6]	1-14-29	35	.....	
Missouri P. C.	1-15-29	45¾	46	50c qu. Aug. 1
Monolith Midwest[9]	1-11-29	8	10	
Monolith P. C. com.[9]	1-11-29	14	14½	8% ann. Jan. 2
Monolith P. C. pfd.[9]	1-11-29	8¾	9¼	
Monolith P. C. units[9]	1-11-29	31½	33	
National Cement 1st 7's[38]	1-14-29	99	101	
National Gypsum A com.	1-15-29	10	12	
National Gypsum pfd.[35]	1-15-29	48	52	1¾% qu. Apr. 1
Nazareth Cem. com.	1- 3-29	27	30	75c qu. Apr. 1
Nazareth Cem. pfd.	1- 3-29	102	105	
Newaygo P. C. 1st 6½'s[29]	1-16-29	101	.....	
New Eng. Lime 1st 6's[14]	1-11-29	98	100	
N. Y. Trap Rock 1st 6's	1-15-29	100	.....	
North Amer. Cem. 1st 6½'s	1-15-29	79½	79¾	
North Amer. Cem. com.	1-16-29	8	9	
North Amer. Cem. 7% pfd.	1-16-29	23	28	1.75 qu. Aug. 1
North Amer. Cem. units	1-16-29	25	30	
North Shore Mat. 1st 5's[16]	1-16-29	98½	.....	
Northwestern States P. C.[37]	1-12-29	145	205	
Pac. Coast Cem. 6's, A	1-10-29	95	96½	
Pacific P. C. com.	1-11-29	26	26½	
Pacific P. C. pfd.	1-11-29	80⅛	84⅞	1.62½ qu. Jan. 5
Pacific P. C. 6's	1-10-29	98	99½	
Peerless Egyp'n P. C. com.[21]	1-11-29	2	2½	
Peerless Egyp'n P. C. pfd.[21]	1-11-29	85	90	1¾% qu. July 1
Penn-Dixie Cem. 1st 6's[29]	1-15-29	96	.....	
Penn-Dixie Cem. pfd.[28]	1-15-29	91	94	1.75 qu. Dec. 15
Penn-Dixie Cem. com.	1-15-29	24½	24⅞	50c qu. July 1
Penn. Glass Sand Corp. 1st 6's, 1952	1- 9-29	103	104½	
Penn. Glass Sand pfd.	1- 9-29	111	.....	
Petoskey P. C.	1-15-29	10	10½	1½% qu.
Riverside P. C. com.	1-11-29	20	.....	
Riverside P. C. 1st pfd.	12-27-28	95	97	1.50 Aug. 1
Riverside P. C., A	12-27-28	20	21	31¼c cum. part. Aug. 1
Riverside P. C., B	1-11-29	1	2	
Sandusky Cem.	1- 4-29	260	.....	$2 qu. Jan. 1 & $4 extra
Santa Cruz P. C. bonds	1-11-29	105¾	.....	6% annual
Santa Cruz P. C. com.	1-11-29	92	.....	$1 qu. Jan. 1 & $2 ex. Dec. 24
Schumacher Wallboard com.	1-11-29	17¼	18	50c May 15
Schumacher Wallboard pfd.	1-11-29	.....	26	
Southwestern P. C. units[44]	12-13-28	270	.....	
Superior P. C., A[20]	1-11-29	46	47¾	27½c mo. Dec. 1
Superior P. C., B[20]	1-11-29	33	34⅝	
Trinity P. C. units[37]	1-12-29	155	165	
Trinity P. C. com.[37]	1-12-29	50	60	
U. S. Gypsum com.	1-15-29	68	68½	2% qu. Dec. 31
U. S. Gypsum pt. paid	1-15-29	50	51	
U. S. Gypsum pfd.	1-15-29	.....	130	1¾% qu. Dec. 31
Universal G. & L. com.[8]	1-16-29	25c	50c	
Universal G. & L. pfd.[8]	1-16-29	5	10	1½% Feb. 15
Universal G. & L., V.T.C.	1-16-29	no market		
Universal G. & L. 1st 6's[3]	1-16-29	50	60	
Chas. Warner com.	1-14-29	39	43	50 qu. Jan. 12 & 50c ex.
Chas. Warner pfd.	1-14-29	109	.....	1¾% qu. Jan. 24
Whitehall Cem. Mfg. com.[36]	1-12-29	150	.....	
Whitehall Cem. Mfg. pfd.[36]	1-12-29	98	.....	
Wisconsin L. & C. 1st 6's[15]	1-16-29	100	.....	
Wolverine P. C. com.	1-16-29	5½	6	15c qu. Nov. 15
Yosemite P. C., A com.[26]	1-11-29	5	7	

*Ann. interest due May 1 and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1. ¶Com. exch'd for 5 shs. new com.; 7% pfd. exch'd for 2 shs. new 7% pfd. [1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney Williams & Co., Inc., Los Angeles, Calif. [46]Stein Bros. & Boyce, Baltimore, Md. [47] Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pref. (sand-lime brick) 16 sh.[6]	par 25	25¾
Atlantic Concrete Material Co. 82½ sh.[1]	$5 for the lot	.....
Benedict Stone Corp. (cast-stone), 50 pfd., 390 com.[1]	$400 for the lot	.....
Benedict Stone Corp. 1st 7's 1934[8]	.....	86
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	.....
River Road Sand and Gravel Co.[9] 200 shares	$21 per share	
River Road Sand and Gravel Co.,[11] 219 shares	$55 per share	
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	.....

Stock	Price bid	Price asked
Simbroco Stone Co.,[10] 10 sh. pfd., par $50	$10.25 per sh.	
Southern Phosphate Co.[6]	1¼	.....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	.....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Winchester Brick Co., pfd., sand lime brick[3]	10c	.....
Winchester Rock Brick Co. pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [3]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [6]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. [8]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [8]Auction sales of $1000, Barnes & Lofland, Philadelphia, March 31, 1928. [9]Price obtained at auction by Barnes & Lofland, Sept. 26, 1928. [10]Price at auction, June 6, 1928, R. L. Day & Co., Boston, Mass. [11]Price at auction, Nov. 21, 1928, by Barnes & Lofland.

Gas and Oil Wells Help Ideal Cement Pay Dividends

DURING DECEMBER the fourth well being drilled by the Ideal Cement Co., Denver, Colo., on its own property at Ada, Okla., blew in as another natural gas well, making 12,000,000 cu. ft. of gas daily. As it already has more gas than it requires, the latest well was "shut in" subject to demand. It now has access to practically 60,000,000 cu. ft. of natural gas from its own wells, and is selling about 100 bbl. of oil every day from the first well it drilled. On December 22 it declared the usual extra Christmas dividend, this time 50 cents, but as the stock was split up, two for one during the year, means the regular extra dollar, and then on January 15, it will have paid the regular quarterly dividend of 75 cents a share on common stock.

Bessemer Cement Dividend

DIRECTORS of the Bessemer Limestone and Cement Co. have declared a cash dividend of $2.50 per share on the "B" stock and the regular quarterly payment of 75c. per share on the "A" common stock, payable February 1 to stock of record January 20. A year ago the company paid a dividend of $1 on the "B" stock. The increase reflects improvement this year in the company business.

Ohio River Sand and Gravel Bonds Listed

THE Baltimore Stock Exchange has authorized the listing of $569,000 first mortgage 6% sinking fund gold bonds.

BALANCE SHEET, JUNE 30, 1928

Assets:	
Property, equipment, etc.	$1,634,997
Sinking funds	12,411
Cash	32,837
Notes receivable	1,911
Accounts receivable	162,702
Investments	60,350
Inventories	26,878
Unexpired insurance premiums	9,320
Deferred charges	68,683
Total	$2,010,091
Liabilities:	
Preferred stock	$ 575,000
Common stock	10,939
Funded debt	648,000
Notes payable	16,019
Accounts payable	87,651
Accrued insurance, interest and taxes	4,956
Reserved for bad debts	4,057
Surplus	663,466
Total	$2,010,091

Asbestos Corporation Dividend

IN ANNOUNCING that directors of the Asbestos Corporation have declared the regular dividend of 1¾% on the preferred stock of the company, payable January 15, 1929, to shareholders of record of December 31, W. G. Ross, president, makes the following statement:

"The company's production, especially of the higher grades of asbestos, fell off during the year, owing to unfavorable feather for mining operations and to poor results obtained from the main pit of the company. Steps have been taken to open this pit up on a larger scale in order to rectify this situation, and it is expected that by the end of next summer normal conditions in this pit will prevail. In the meantime, this has decreased materially the operating profit.

"The progress on the construction of the large new mill at the Beaver-Consolidated properties has been pushed, and this mill will be ready for operation by February. Owing, however, to an unfortunate collapse of a portion of the tunnel connecting the pits with this new mill, which took place in October, it will delay the time when full benefit will be obtained from the operations of this new lay out. The management has, in the meanwhile, made arrangement to supply the mill with the necessary rock until such time as the tunnel is completed, which will be some time next August.

"The demand for the company's products continues good."

Lehigh Cement Annual Statement

A COMPARISON of the business of the Lehigh Portland Cement Co. for the years ending November 30, 1927 and 1928 is given as follows:

	1928	1927
Sales, less discounts, allowances, etc.	$23,522,906	$27,642,843
Manufacturing and shipping cost	13,108,687	16,701,564
Provision for depreciation, obsolescence and accrued renewals	2,271,848	2,222,740
Selling, administrative and general expenses	3,866,982	4,221,719
Net profit from operations	$ 4,275,389	$ 4,496,820
Miscellaneous income	405,319	274,148
Total income	$ 4,680,709	$ 4,770,969
Provision for federal income taxes	556,318	652,125
Net income carried to surplus account	$ 4,124,391	$ 4,118,844
Earnings per share on 450,348 shares common stock (par $50)	$5.79	$5.64

SURPLUS ACCOUNT NOVEMBER 30, 1928

Balance at November 30, 1927	$29,123,004
Net income for the year 1928 (as above)	4,124,391
Adjustment of unrealized appreciation for stone removed	21,486
Total surplus	$33,268,880
Dividend on common stock paid in 7% cumulative preferred stock	22,517,400
Applicable to stock in treasury	Cr. 24,100
Preferred dividends	1,537,433
Common dividends	842,025
Premiums paid on 8,207 shares of 7% cumulative preferred stock retired	71,992
Surplus carried to balance sheet	$ 8,324,131

COMPARATIVE BALANCE SHEET, NOVEMBER 30

Assets:	1928	1927
Land, buildings, machinery and equipment	$30,326,321*	$32,009,712
Mineral deposits, less depreciation	1,729,808	1,676,699
Invested in and advanced to affiliated companies and subsidiaries not consolidated	3,114,481	3,024,619
Workmen's compensation insurance fund invested in United States government obligations	314,729	204,482
Treasury stock—common at par	30,750	23,500
Miscellaneous stocks and bonds	107,520	123,379
Cash	5,057,285	5,527,084
Demand loans	2,500,000	4,000,000
Liberty Loan bonds and United States Treasury certificates	5,158,500	258,550
Working funds and advancements	166,191	188,817
Accounts and bills receivable, less reserve for discounts and doubtful accounts	1,745,377	1,711,269
Inventories	4,645,452	5,281,255
Unabsorbed stripping charges, etc.	1,041,282	1,020,367
Prepaid insurance	56,638	57,105
Total	$55,994,335	$55,106,789
Liabilities:	1928	1927
Preferred stock	$21,696,700	
Common stock	22,517,400	$22,517,400
Accounts payable	775,059	672,947
Accrued wages, salaries and general taxes	316,952	357,183
Reserve for federal income taxes	556,318	652,125
Dividends payable	662,137	562,935
Reserve for returnable cotton duck bags	226,813	332,694
Reserved for compensation and fire insurance reserves	489,664	437,855
Unrealized appreciation arising from appraisal of mineral deposits	429,161	450,646
Surplus	8,324,131	29,123,004
Total	$55,994,335	$55,106,789

*After reserve for depreciation of $16,767,107.

Northwestern Portland Cement Dividends

A NOTABLE example of success in the cement manufacturing industry of the Pacific coast has been set by the Northwestern Portland Cement Co., declare authorities on the subject. It was organized by George Macdonald and C. T. W. Hollister, both of whom were associated prominently with the Oregon Portland Cement Co. at Oswego. Mr. Macdonald organized the Sun Portland Cement Co.

A regular monthly dividend for Christmas has been received by shareholders of the Northwestern Portland Cement Co. Commencing operation last April, the company paid its initial dividend in August and since then has paid 2% monthly on its $1,350,000 of stock. There are nearly 500 holders of this company's stock. Most of them reside in Portland and elsewhere in Oregon, with a liberal representation in Washington.—*Portland* (Ore.) *Journal.*

Recent Dividends Announced

25c, Feb. 1 American Brick Co. com. (qu.)..
50c, Feb. 1 American Brick Co. pfd. (qu.)..
1⅜%, Jan. 15 Asbestos Corp. pfd. (qu.).....
Southern Asbestos 25c extra and semi-annual div. $1.25, Jan. 15.

All International Cement American Subsidiaries Now "Lone Star" Companies

THE INTERNATIONAL CEMENT CORP., New York City, has now changed the names of all its American (United States) subsidiaries to the "Lone Star Cement Co.," of New York, Pennsylvania, Virginia, etc. All of the various mills' brands were made "Lone Star" two or three years ago, this being originally the brand name of its Texas Portland Cement Co. only, the others having equally well-known brands at the time.

Superior (Ohio) Cement Plant Sets 1,000,000-Bbl. Goal for 1929

THE CEMENT PLANT at Superior, Ohio, operated by the Wellston Iron Furnace Co. is forging forward with seven-league boots toward the goal of becoming one of the outstanding industries in Ohio and in the van of cement mills in the nation, says the *Jackson* (Ohio) *Herald* of January 9, which continues: Each year sees a substantial gain in the production capacity of the plant and this year it leaps forward with the goal set for the year 1929 at one million barrels produced and sold. Judging the demand for the coming year by the sales in 1928 the management has set the estimate at 750,000 bbl. of portland cement and 250,000 bbl. of "Wifco" patented mortar cement.

At a meeting of the salesmen and the manufacturing heads held at the Cambrian hotel in Jackson January 7, S. E. Stephenson, president and manager of the plant, in a calm manner announced that he expected to produce and sell that quantity and without batting an eye the entire force of salesmen and the superintendent of various departments assured him that they believed it is possible.

A fine talk on salesmanship was made by A. H. Harris, a new man just placed on the force. He had previously worked in Detroit and there he made some very remarkable strokes of tact in introducing the use of "Wifco." When he began there he had the opposition of the contractors, dealers, architects, and the building inspectors to overcome but now "Wifco" is the leading mortar used in that great city and is supplanting the old established mortars which have been used for years. By demonstrations and repeated tests he has induced the building commission to include "Wifco" as a standard specification for sub-surface use where heretofore portland cement only was permitted. Working through the trade schools and the building inspectors he had established "Wifco" in favor with almost all the contractors and had sold 25,000 bbl. the first year, his allotment being 10,000 bbl. with a big question mark.

Mr. Harris has now been placed on the sales force to introduce "Wifco" into the large cities within the territory where it has not been established and to assist other salesmen in fields where especially difficult problems arise.

E. H. Berry of Cincinnati told of the Cincinnati market and showed how the establishment of the wharf-boat storage with shipment by river from Ironton had been a great advantage and resulted in an increased sale in places where they had never before been able to get their cement.

T. C. Evans, traffic superintendent explained several things in connection with the shipments and told of efforts which they hoped to carry through successfully with the Interstate Commerce Commission securing more favorable freight rating which would enable them to extend their market to the east and south, extending their limits to Pittsburgh on the east, Kentucky on the south and Illinois on the west. A hearing is to be held soon in Chicago and a favorable ruling is confidently expected.

Other talks were given by John Blank, the general superintendent of the plant; Victor Diefenderfer, superintendent; Ed. Compliment, mine superintendent; Paul Ballard, a new salesman; H. J. Shepherd, "Wifco" superintendent; H. J. Shear, salesman, Jackson; J. J. Williams, time keeper; E. C. Horton, store keeper; Fred Besco, chief chemist; George Henry, shipping clerk; Fred Hankin, cashier; H. R. Lakin, salesman in Columbus; John C. Baxter, salesman in Huntington, representatives of the two Jackson newspapers who were guests and the dinner concluded with a general round table in which everyone took part.

Missouri Company Producing Molding Sand

MOLDING SAND of exceptional quality is being mined in a pit on the Schifferdecker land, just north and west of Schifferdecker park, by the Joplin Sand Co., Joplin, Mo., according to H. J. Roy. Trials at several foundries of this district have been made with satisfaction.

The sand is about 18 in. below the surface. At present a 12-ft. face is being mined, and it is thought that the sand will go deeper. Mr. Roy has traced the sand body across the entire 120-acre tract under lease by the company.

Assays are being made by the sands from different sections of the pit, and if these are satisfactory, equipment will be installed which will greatly enlarge the production of the pit. A nearby railroad is said to be ready to build a spur to the pit.

Local foundries buy their molding sand in Ohio and other eastern states and it costs $3.50 a ton f.o.b. cars. Local foundries use many cars of sand a year. In the immediate vicinity of Joplin there are more than 400 foundries, giving a large market for sand.—*Joplin* (Mo.) *Globe.*

Southwestern Cement Mill at El Paso to Have New Power Plant

EXCAVATION WORK has started for a $175,000 power plant at the Southwestern Portland Cement Co., El Paso, Tex., which will complete an improvement program started by the company in November, H. E. Nichols, superintendent, said recently.

All of the company's older power equipment will be replaced by a 3500 kw. Westinghouse steam turbine and generator unit, according to Mr. Nichols, who expects the new plant to be operating by May.

The company recently installed a $75,000 cottrel electrical precipitation plant to do away with spread of dust, which constituted a neighborhood nuisance, as well as a source of financial leakage to the company.—*El Paso* (Tex.) *Post.*

Highway Research Board to Investigate "Curing"

AT THE MEETING of the Highway Research Board of the National Research Council in Washington, December 13, R. W. Crum, director, announced that arrangements had been made for conducting an investigation of methods of curing concrete pavement slabs. The work will consist first in making a correlation survey of all available existing data. These data will be analyzed and submitted to a special committee appointed by the board. The further program of the project will depend upon the findings of this committee.

The Highway Research Board does not itself carry on research work, but from time to time special investigational projects are organized for correlating the work of the research agencies for promoting additional research and for disseminating the results of research.

Florida Crushed Stone Industry Improving

SHIPMENTS of limerock from the Ocala territory have shown an increase of approximately 50% within the past few weeks, according to F. B. Langley, district superintendent of the Atlantic Coast Line railroad. Inquiries among the shippers are to the effect that all indications point to heavy shipments continuing for the next three or four months. Rock is being sent to all sections of the state, it is stated, the bulk of it, however, going to the southern part of Florida and along the East Coast. Repaving highways and streets in those sections is believed to be the reason for the increased business at this time, although considerable work of this nature is going on in other parts of Florida as well as unusual activity in road construction.—*Jacksonville* (Fla.) *Times-Union.*

Thirteenth Annual Convention of the National Sand and Gravel Association

Cleveland, Ohio, Convention Proceedings

EQUALLING in size and interest any previous meeting of the National Sand and Gravel Association, the 13th annual convention met on Wednesday, January 9 at Cleveland, Ohio, for three days of sessions. The results of the careful pre-convention planning by convention committees were evidenced by the fine attendance, excellent exhibits and varied social features of the meeting. The visitors from all parts of this country and from Canada, as well, certainly found enough of interest and stimulus in the sessions, and out, to warrant their deep appreciation for the efforts put forward in their behalf.

Much of the success of the three-day meeting is due to the work of ***Hal G. Knight*** of the Rubber City Sand and Gravel Co., Akron, and to the other producers in the Ohio district who gave unsparingly of their time and efforts to put the convention across in a good style.

President R. C. Fletcher called the convention to order in the Hollenden Hotel on the morning of January 9, with a short address of welcome. He spoke particularly of the healthful state in which the association was placed, calling attention to the fact that sand and gravel tonnage represented by the association had increased more in the year just past than in any previous year during the organization's life. He attributed the growth of the association directly to a better feeling of co-operation among members.

In an address of welcome on behalf of the city of Cleveland, ***B. F. Hopkins,*** the city manager, seconded what Mr. Fletcher said about co-operation, saying that the immense increase in the general business of the United States is in no small measure due to the get-together spirit, as represented by just such meetings as the gravel convention. He urged his listeners to remember that the deciding factor for them must always be the consumer, and if the association could help them serve the consumer to a better advantage, then it was their duty to support such an association, and thus help.

Trade Association Activities

Speaking in behalf of the trade association department of the Chamber of Commerce of the United States, ***Dr. Hugh P. Baker*** extended the best wishes of the chamber in an address entitled "Know Your Association." He pointed out the need of organization in the new competition which is the competition between industries instead of between individual concerns. The national Chamber of Commerce has recognized the value and necessity of these trade organizations, he said, and has formed a special department to advise in the formation and operation of such associations. In the studies made by this department, of which Dr. Baker is the head, he said that it had been found that the intangible benefits derived from an association were as great, if not greater, than the so-called tangible results. Under the latter he placed research work, development of the knowledge of costs,

R. C. Fletcher, who was re-elected president of National Sand and Gravel Association

credit bureau work and trade extension. He explained the last named feature as meaning an extension of trade entirely outside of any existing market and not merely the taking of trade from one producer by another. Such extension is best carried on through advertising campaigns. Further features of the tangible advantages of an organization are the possiblity for the use of arbitration, the establishment of a traffic bureau, and, perhaps the most important of all, the elimination of bad or uneconomic practices in the industry, such as price-cutting, secret rebates, various forms of commercial bribery, selling below cost, and untruth in advertising. The intangible advantages of an association are pretty well summed up in the confidence which it inspires between the members, by which all of the other forward steps are possible. Moreover the association works for the good of the whole industry, and the member becomes conscious of a new responsiblity not previously recognized. The association can study the whole industry and determine what legally can be done for it.

Get-together Luncheon

With ***J. L. Shiely*** presiding, the noon luncheon of the members, guests and associate members was a great success. Saying that one of the most important reasons for coming to the convention was to let the machinery men solve your problems, Mr. Shiely turned the luncheon into a general "get acquainted" meeting. Many of the old-timers in the industry were called upon to stand, but there was no long speechmaking. Mr. Shiely then introduced Douglas Malloch, of Chicago, who, as a poet, professed no first-hand information on the sand and gravel industry and so told a number of good stories instead, interspersed with epigrammatic shots at life in general.

More Money Needed

The morning session of January 10th opened with the report of the president, R. C. Fletcher, who reviewed the growth of the industry and the association during the year in which he had presided. This was followed by the report of the executive secretary, ***V. P. Ahearn.*** Mr. Ahearn spoke first of the surprising growth of the association, pointing out that the value of its tonnage has increased 152% in the past ten years. He stated that, although the demands on the association had been increased proportionately, the income of the organization from dues had not so increased, due to several factors. He pointed out that if the association was to continue to provide the same service, an increase in revenue through a change in the dues must be effected.

Mr. Ahearn said the association felt that the prospects for the coming year were good particularly in two lines which had showed a marked increase in the past. These were in the use of gravel for railroad ballast and for the construction of gravel roads. Considerable attention was given in the report to the car supply for the industry, and also to the allied phase of car servicing. It was stated that this matter had been taken up with the National Crushed Stone Association and the National Slag Association, and that the three organizations were working together on the problem of getting the carriers to supply cars in the proper condition.

Compensation insurance for marine operations was mentioned in the executive secretary's report, as the association had done much to obtain relief in this matter. A fuller report by J. L. Richmond on this work

was presented to the convention, and will be found below. The other important matter of the secretary's report concerned the program for the establishment of a standard scale of depreciation for the producers of the industry to be used in connection with profits tax reports. This scale is to be decided upon by the association and submitted to the treasury department for approval. The department will then submit it to all producers who will thus have an opportunity to make any suggestions or objections they desire. After it is finally approved, any producer may use the scale, without question, to determine his depreciation. On the other hand, if a producer feels that the scale does not rightfully apply to his operation he does not have to follow it, provided he can explain his reasons for the variation.

Activities of the Staff

In a short resumé of the duties of the executive secretary, Mr. Ahearn called attention to the fact that during 1928 he had traveled more than 21,000 miles on business of the association, and spent 75 days in the field keeping in touch with the producers and local associations.

Stanton Walker, director of the engineering and research division of the association, reported on the progress made in his department during 1928. He classified the activities for the year roughly under the following subdivisions:

1. Preparation and distribution of literature giving information concerning the use of prepared sand and gravel.
2. Distribution of information through correspondence in response to inquiries received from both those within and without the industry.
3. Distribution of information through talks delivered before groups of engineers, contractors, sand and gravel producers, etc.
4. Cooperation with engineering societies and committees concerned with specifications for sand and gravel.
5. Direct engineering service to member companies.
6. Researches in sand and gravel carried out in the newly established laboratory.

In the space available it would be impossible to give more than the briefest outline to the activities listed above. Most of them, however, will be readily understood by producers. One interesting phase should be noted, however. This is that the association is attempting through its publications and research work to be considered as a real source of accurate engineering information and not merely as a promotional agency. That this has been accomplished is evidenced by the increasing number of engineers, research laboratories, colleges, and similar organizations which find the publications interesting and valuable.

Gravel Railway Ballast

J. A. Heaman, chief engineer of the Grand Trunk Railway said in his talk on "The Use of Gravel as a Railroad Ballast": "Owing to the rapidity with which railway construction proceeded on this continent during the last century and the necessity of keeping down the cost of this great mileage thus created, most of it through partially developed or undeveloped country, as low as possible, the American railroads did not provide the drainage of the roadbed or the ballast foundation for the track that was considered necessary on the European roads. As a result tie renewals have been high, heaving of track has been excessive and a smooth riding track difficult to maintain. The more important and heavier traffic roads

V. P. Ahearn, executive secretary

have, however, been diligently improving their roadbeds and all railroads have been giving more and more attention to improved drainage and ballast. There is no difference of opinion among railway men as to the economy of this work; the increased cost of cross ties and the necessity of preserving our timber resources alone being almost a determining factor.

"The use of bank run gravel for railway ballast is practically contemporaneous with the construction of railways on this continent. It was generally readily obtained adjacent to the railway, and furnished, when of fair quality, good drainage and a firm foundation for the track structure, all at a low cost. It is still the material most generally used and will be for many years to come on the less important lines.

"Bank run gravel, however, excepting rare deposits which occasionally are available, has characteristics varying with each deposit and usually detrimental in their effect. These peculiarities limit or defeat the results which might otherwise be obtained from its use in many ways, most frequently as to stability and drainage of the roadbed and usually in creating a dust nuisance which is not only harmful to rolling stock, but most disagreeable to passengers.

"It is in improving the natural deposits by removing their objectionable characteristics that the National Sand and Gravel Association comes into the picture. Better ballast at low cost, and more of it, is a problem in which this association has furnished a great contribution to improved railway service in this country and I am of the opinion that the treatment of gravel for railway ballast is but in its infancy.

"In determining the type and quality of ballast to be used on any section of railway, consideration should be given to, among other features, the following: Allowable expenditure, maintenance charges, character of traffic, and available material. It is very apparent that expenditure and available material are intimately related and where gravel susceptible of a treatment which will give a satisfactory ballast is available, this source of supply should have careful consideration, always, however, the question of cost will intrude and frequently the bank run gravel is the result. In this connection a few remarks relative to the use of bank run gravel may hold some promise to the association.

Why of Washed Gravel

"The cost to the railway company of bank run gravel as compared to a washed and crushed ballast is not all apparent on the surface. The advantages of the freedom from dust and the better drainage is of course appreciated, but the fact that in the average deposit, at least in Michigan with which I am most familiar, carries about 45% of sand, all of which must be hauled at an approximate cost of 7 mills per ton mile, must be unloaded and placed under the track at a considerable cost is sometimes overlooked. This sand, beyond a small percentage, is not only of no advantage but is harmful, serving only to clog the drainage.

"Again there are frequently gravel deposits available along the railway which are unsuitable for ballast as bank run material, but which on treatment make an excellent ballast and the saving in haul may pay or more than pay for such treatment. In my opinion, the possibilities of improving the ballast on any section of line with a better quality of gravel ballast by treatment should be given very careful investigation when ballasting is under consideration, as the use of this improved material raises no question of changes in maintenance methods which the substitution of a more expensive material involves. There is here, I believe, a line of endeavor open to your association; namely, the utilization of abandoned railway gravel pits by treatment and the furnishing therefrom a satisfactory ballast both to the advantage of the railway and the operator; and you will be adding to the obligation of the railways to the association in working out this problem. Whether or not movable plants can be developed to do the work economically is a question which you undoubt-

edly can determine, if the suggestion is worthy of consideration.

"In re-ballasting a section of single track railway, say 100 miles in length, the average amount of ballast required for a lift of 10 in. would be 350,000 tons and should be applied in not over two years, frequently in one. The cost of installing and removing a plant to another location, less depreciation, etc., can therefore de divided by 350,000 tons.

"In considering gravel when untreated or treated for use as ballast, it is necessary to bear in mind that gravel is a natural product and nature is an eccentric mistress. The necessity for ample and complete test of available supplies is imperative.

"In planning a railway ballast operation the railway must be assured of a uniform regular supply so that its work gangs can be kept economically employed throughout the working season. This means that the character of the gravel pit and the certainty of it furnishing a satisfactory material must be known.

Joint Operation of Pits

"Frequently ballast production is not the most important nor the most remunerative of the operations of a gravel washing plant and with a large demand for concrete aggregates the ballast production suffers. The railway naturally is desirous of securing the lower price coincident with joint operation, but the two should be coordinated and the plant provided to give during the rush season at least the minimum agreed upon with the railway. If known in advance that during certain seasons a minimum delivery only can be expected, the railway forces can be adjusted accordingly at much less cost than occasioned by an intermittent supply. Negotiations with railways in which the lower cost of ballast if taken so as to fill out a full production, except during a short rush period may show how this problem may be handled.

"The failure of gravel companies to furnish a uniform supply of ballast has frequently caused the railway to go back to its old pits and resurrect the old shovel which did at least furnish the material as required.

Need Crushed Material

"It may be interesting to note that there has been during the last few years quite a change in the views of such a body as the American Railway Engineering Association on washed ballast. The specifications adopted previous to 1926 provided for not more than 20% sand and not less than 15%. The revision recommended in 1927 specifies certain percentages of crushed material which shall be accompanied by certain percentages of stone between 1½ in. and 1/10 in. with fairly wide tolerance allowed. The sand passing 1/10 in. ring is, however, cut to 3% and the larger dimension reduced to 1½ in. from 2½ in. These specifications cover washed ballast containing from 0 to 20%; 20% to 40%; and over 40% crushed material. The A. R. E. A. specifications indicate the need of crushed material in washed gravel ballast to hold the track in line and prevent creeping and with this most railway engineers will agree. The suitability of a gravel deposit for use as washed ballast more frequently depends upon the amount of material in it large enough to require crushing than upon any other factor.

"There is some difference of opinion among railway men as to the amount of sand allowable or desirable in railway ballast. My own view is that it is no more desirable in washed gravel ballast than in crushed stone ballast if the requisite amount of crushed stone is available to give a stable ballast and I would not favor a washed gravel ballast lacking this characteristic.

"While commenting on specifications, mention may be made of the necessity of a thorough washing and the elimination of dust thereby. This is a prime requisite of washed ballast, but my experience has been that except where strata of clay intrude into a deposit no complaint could be made of the cleanliness of the product and where clay intrudes it should be eliminated by other means than washing or results are doubtful.

Stanton Walker, director of engineering, and research division

"During the last three years the Grand Trunk Railway has ballasted the Chicago-Port Huron line between Hayford and South Bend, 76½ miles of double track railway. This is a part of the program of ballasting this line between the two points first mentioned. In this work there has been used 700,000 tons of washed gravel ballast. The results have been generally satisfactory, a dust-free, smooth-riding track being the result. In the maintenance of this track it has been found unnecessary to change the maintenance organization in any respect and it is believed maintenance costs will be less than with stone and equally satisfactory."

Report of the Directors' Meeting

The most important business of the directors meeting, which was held on the afternoon of the first day of the convention, was the discussion of a new scale of dues for the membership. As noted before, the change in dues is to create a larger income which, at the same time, would be more equitably distributed. While the new scale was read to the convention, the association has requested the trade papers to withhold publication of it until the executive secretary can prepare a complete statement regarding the reasons for and the advantages of the change. It is expected that this will be made public within a short time. The new scale of dues is to go into effect March 1.

An amendment to the constitution was approved by the convention following its discussion in the directors' meeting. The amendment was to Section 3 of Article 3, and changed the amount of dues of associate members of the association. The former charge was a flat rate of $50 per year, but the amendment did away with the flat rate and placed the fixing of the rate in each case at the discretion of the executive committee. This was done so that the dues of associate members could be made to conform more closely to the new scale of dues for regular members.

Two-Course Concrete Roads

In a paper on "Two Course Concrete Pavements," ***Major T. M. Ripley,*** chief engineer of the Greater Motorways System of Erie County, N. Y., said: "The producer of gravel, among his other problems has that of disposition of the entire output of his plant and like the producer of broken stone he has frequently found it difficult to dispose of the finer portions of his coarse aggregates; namely, pea gravel.

"In the original concrete pavement design the full thickness of the pavement was built in one operation, of the same constituency of mix, and in a great majority of cases a much larger proportion of 2-in. and 3-in. stone was required than that of a smaller size. In some instances specifications excluded the smaller size, namely pea gravel, on the assumption that a stronger pavement was thereby secured. The exclusion of this smaller part of the coarse aggregate worked a great hardship upon many producers.

"Several years ago the county engineer of the County of Erie, George C. Diehl, began building a two-course concrete pavement. There were several reasons for attempting this type, but the one in which we are particularly interested is its effect on your production. The first of these pavements in Erie county, exclusive of experimental pieces, was laid in 1925, when 94,809 sq. yd. were put down. From 1925 to 1928, inclusive, there has been laid 98.52 miles, equal to 1,021,724 sq. yd., by the County of Erie. What makes this of particular interest to the gravel producer is the fact that the top course of this pavement uses as its aggregate

the pea gravel, exclusive of the larger sizes.

"In the early years of this work it was at first difficult to convince contractors that there was not a material increase in cost of doing the work by the two-course method over the one-course method. The steel reinforcement in pavement has become a standard practice in all progressive states and the placing of this reinforcement was usually about 2 in. from the surface of the pavement, and, moreover, as specifications required that the concrete should be screened to the proper elevation for receiving the reinforcing material, it was brought to the attention of complaining contractors that they were practically building a two-course pavement under the one-course specifications and that the only difference in the manipulation of the two classes of material was a little more thought exercised in delivering material to the mixture and in proportioning the same. As practically all concrete pavements were being laid from 6 to 8 in. thick, it is readily seen that the No. 1 product under the two-course pavement design immediately obtained a monopoly on from 25% to 33⅓% of the total pavement laid. This in many cases immediately solved the problem of disposing of the entire product of the finer aggregate from many pits.

Use for Pea Gravel

"The matter of keeping the red figures off your ledger is a matter of vital importance to every producer, and one method of doing this is to dispose of your entire product. Therefore it is the duty of the producer of pea gravel to bring this matter of two-course concrete to the attention of his clients, if they are not already using the same.

"Let us see what the use of two-course in place of one-course concrete pavement would mean to the producer of pea gravel. Assuming the one-course to be 1-1½-3 mix using run of crusher (exclusive of sand below ¼-in. and No. 1 stone in excess of 25% of the coarse aggregate), and assuming the two-course pavement to have a bottom course two-thirds the thickness of the pavement with a 1-2-4 mix, the top course one-third the pavement thickness and mixed 1-1-2, using only No. 1 for coarse aggregate, then the one-course pavement could contain not to exceed 25% of No. 1 gravel. The two-course will contain 25% of two-thirds, equal to 16.6%, plus 100% of one-third, equal to 33.3%, or a total of 49.9%. In other words, the use of two-course concrete pavement doubles the amount of No. 1's allowable in the mix. As the total output of sand and gravel is about 200,000,000 tons per annum, and one-quarter of this amount goes into highway work, you can readily compute the value of this 100% increase."

Ready-Mixed Concrete

Norman Beggs, of the Portland Cement Association, of Chicago, spoke on the "Manufacture, Delivery and Sale of Ready-Mixed Concrete." This paper is reprinted in part in the Cement Products section of this issue, where it can be readily referred to, so that it is only necessary to state here that it covered the development of the ready-mixed concrete plant with unusual completeness, and was well illustrated with lantern slides of plants and conveying trucks.

Car Servicing

A report of the Committee on Expense Involved in Cleaning and Repairing Railroad Cars by the Sand and Gravel Industry was read by Mr. Ahearn. ***J. C. Buckbee*** is chairman of the committee. The report states that the gravel industry expended annually an amount estimated at one and one-half million dollars for reconditioning cars. It was pointed out that legally the carriers are required to furnish cars which are in good condition, and that do not leak. At noted above, the National Sand and Gravel Association joined with the crushed stone and slag associations to see what could be done about the situation. Questionnaires were sent out to the members of the three associations and from these each association was to make out an individual report. The sand and gravel report has been completed, but the committee had not yet received the other two reports. When these are completed, a meeting will be arranged with the railroads, and it is expected that this will be held within a month. The idea throughout the whole study is to settle the matter amicably without the necessity of any legal battle.

Marine Compensation Insurance

A report of the Committee on Compensation Insurance for Marine Sand and Gravel Producers was presented by ***J. L. Richmond,*** chairman. The report states:

"At the Detroit convention of the National Sand and Gravel Association last year, a committee was appointed to study state compensation insurance laws affecting sand and gravel producers on inland waterways and to suggest ways and means of modifying state and federal laws, which would eliminate the perplexities arising from present laws.

"The committee met as a whole at Chicago last June and discussed the subject from many angles and we make the following recommendations: That the association appoint committees in the various states where the producers are affected, to work through their state compensation insurance commissions or agencies in charge of the administration of workmen's compensation laws of the state. If the commission is brought to see the advantage of such legislation to the employers in the state, they will probably draft an amendment that will fit in with the state law and either recommend it to the state legislature or make a favorable report on it when the matter is referred to them by the committee of the legislature having the bill in charge.

"The present federal law requires the U. S. Employees' Compensation Commission to recognize insurance either through an insurance policy or a state fund. Some of the states—namely California and New York—have modified their laws to extend the coverage of their state funds so as to place the funds in the same position as insurance companies so far as concerns coverage of liability under the federal longshoremen's act. The insurance company can write a policy covering liability under the state workmen's compensation and, by an endorsement attached thereto, cover also the liability of the same employer under the longshoremen's act.

"When a state legislature authorizes its state fund to do so, it may also write the double coverage and thus be on an equality with the insurance company. Of course, in a state like Ohio having a monopolistic state fund to cover workmen's compensation and not allowing it to be covered by insurance policies, the only way for employers to cover their state and federal liabilities in one operation is to have the state fund law amended so that it can cover also the federal longshoremen's liability.

"It is recommended that a circular of information be sent out to all members of the association who are affected, discussing the results of our investigations and our recommendations; and that is that the state, longshoremen's, and maritime insurance all be worked out in the one state fund. It will not be difficult for our members to find out the status as to state coverage by insurance policy or state fund or both, or either exclusively. It should be possible to secure legislation for extending the state fund in practically all states having such funds, and this at the next session of the legislature.

With respect to whether the federal longshoremen's act can be amended so as to bring within its provisions the crews of vessels operating upon the rivers and inland waterways, including the Great Lakes, it is of interest to note that the U. S. Employees' Compensation Commission has recommended to Congress in its annual report the inclusion of crews on fresh waters in the longshoremen's act and, possibily, also small craft in and around the harbors of salt waters.

"We should try to get the members of the proper committee of Congress to introduce a bill for the purpose. Such an amendment to the longshoremen's act would be useful even though we would have no immediate success in amending the state fund laws of the several states, for it would then require only one insurance policy to cover the longshoremen's law liability without the additional policy to cover the admiralty and maritime liability on the crew.

"Either federal or state legislation along the lines suggested would be help-

ful, but the complete solution of our problem is an amendment of the longshoremen's law, so that the state fund, when amended, would cover not only the shore liability as it does now, but all other liability our members have. The payment of but one premium to the state fund would avoid much expense."

Judge Ward, of the federal compensation court, commented on the committees report, and said that if the federal commission could do anything to forward the work of simplifying the present compensation situation it would be glad to do so. He stated, however, that the commission could not inaugurate such changes. Business men who are interested must see to amending the state laws, and the federal laws will have to be changed by congressional action, he said. After the action is started by the producers, the commission will be in a position to help in furthering the changes, he stated in conclusion.

Banquet and Entertainment

On the second evening of the convention the annual dinner-dance was held. Under the direct supervision of Hal Knight and C. E. Glander, the dinner proved to be the outstanding affair of the convention. Entertainment was furnished during the banquet, and also during the dancing which followed.

Election of Officers

The nominating committee, of which Hugh Haddow was chairman, named the following officers for the coming year and they were elected by acclaim:

President, R. C. Fletcher, Flint Crushed Gravel Co., Des Moines, Iowa.

Vice-president, F. D. Coppock, American Aggregates Corp., Greenville, Ohio.

Secretary-treasurer, H. S. Davison, J. K. Davison and Bro., Pittsburgh, Penn.

The executive committee consists of the above officers and R. S. Potts, Potts-Moore Gravel Co., Waco, Tex., J. C. Buckbee, Northern Gravel Co., Chicago, H. V. Owens, Boonville Sand Co., Utica, N. Y., and F. W. Peck, Muncie Sand Co., Kansas City, Mo.

The directors at large, elected by the board are H. V. Owens, F W. Peck, and Fred Hall, Ohio River Sand and Gravel Co., Cincinnati, Ohio.

Transportation and Business

In a talk on "Transportation in Its Relation to Business," ***H. G. Taylor,*** manager of the Public Relations Section of the American Association, spoke of the marked increase in the carrying capacities of the carriers due to co-operation between shippers and the railroads. In 1920, a total of 2,097,000 cars of freight were handled, approximately 98,000,000 tons, but in 1927, more than 3,129,000 cars of freight, totaling 161,775,000 tons, were handled. Moreover this increase in tonnage was accomplished with practically the same number of cars that were available in 1921. This increase was largely due to greater efficiency in operation and to the help of shippers, particularly in getting heavier loadings on the same cars. Next to loadings of coal and ore, sand and gravel is the material which loads the heaviest of any of the commodities carried by the roads. If the producers can raise the average loading by only one ton per car, an enormous saving in handling the product will be effected. Mr. Taylor urged that the gravel producer lend their assistance in this matter, stating that through this co-operation they could obtain much better service, and aid the roads at the same time.

Benefits of Safety Campaign

The last address of the convention was delivered by ***W. W. Adams*** of the United States Bureau of Mines. Mr. Adams spoke of the possibility for the extension of safety work in the sand and gravel industry, saying in part, "In view of the magnitude of the industry, whether measured by tonnage or value, it is pertinent to ask how it ranks with the other branches of mining and quarrying in the matter of the safety of its employes. So far as I am able to learn, there is very little information available on this subject.

"When Congress created the Bureau of Mines 18 years ago it provided that one of the principal features of the work of the new organization should be the conduct of inquiries and scientific investigations with the purpose of increasing safety in the mining, quarrying, and metallurgical industries. More than a million men are employed in these industries and about 200,000 of them are injured every year. As part of its regular safety work, the Bureau of Mines collects statistics of accidents at mines and quarries. These statistics not only aid the bureau in its safety studies, but they also make available reliable and definite information for the use of mining and quarrying companies and of other organizations and individuals who are directly interested in the prevention of accidents. Until the past few years these statistics were based exclusively on yearly reports, made out on forms prepared for the purpose, and furnished voluntarily by the mining and quarrying companies to the Bureau of Mines at the close of each calendar year. These yearly reports are brief. They do not contain a description of each accident but are submitted in the form of a tabulation of the number of accidents arranged according to a standard list of causes which has been in use for many years. The bureau's yearly statistics are believed to be reasonably complete for the whole industry, but the information is more or less general in character. More detailed information is essential to gain a clear understanding of the underlying causes of the accidents, the nature of the resulting injuries, and the relative frequency and severity of injuries of different types. An appreciation of this need for more detailed information led the bureau, about five years ago, to seek the further co-operation of some of the larger operating companies. Companies were asked to send the bureau a carbon copy of the report of every accident that injured an employe. Several hundred companies volunteered to do this, and they have been furnishing the information ever since. The National Safety Competition was an outgrowth of the co-operation of these companies.

"The National Safety Competition is a yearly safety contest in which the companies compete for a bronze statute or trophy known as the 'Sentinels of Safety.' This statute depicts a mother and child awaiting the safe return of the father after the day's work in the mine or quarry. The trophy is of very artistic design, and it is the work of Begni del Piatta, a well-known artist and designer of New York City. The trophy itself is the gift of the *Explosive Engineer* magazine.

Five trophies are awarded annually, one each to an anthracite mine, a bituminous coal mine, a metal mine, a nonmetallic-mineral mine, and a quarry or open-pit mine.

What Competitions Have Done for Safety

"The fourth face of the pedestal is reserved for engraving the name of the company that wins the right to hold the trophy for a year. The annual award is made to the mine or quarry whose records show the smallest loss of time from accidents in proportion to the total number of man hours worked. This ratio is called the accident-severity rate; it represents the number of man days of disability from accidents for each thousand man hours of exposure to hazard. It includes all accidents that disable a man for more than the remainder of the day on which he was hurt. The relative standing of the companies is determined by an examination of accident reports which the companies send to the Bureau of Mines. These reports are carefully recorded as rapidly as they are received. They usually indicate the number of days the employee was disabled. If the injury should be of long duration, the company sends the bureau a supplemental report showing the date on which the employe recovered and was able to resume work. These records are summarized for each plant at the end of the year; the summary is sent to the company for verification as to accuracy and completeness, and is then returned to the Bureau of Mines. Our office them arranges all of the records in

the order of the accident-severity rates of the companies. A report covering the five leading companies in each group is sent to a Committee of Award, which is composed of seven members—men who are well known in the mineral industry but are not connected with the Bureau of Mines. The committee is required to select the company having the lowest accident-rate; in the case of a tie the committee may, by majority vote, decide the winner. The results of the contests are given wide publicity.

How Contests Are Conducted

"The names and records of the winning companies are published by the bureau as broadly as possible, as are also the names and records of the companies that win honorable mention for ranking second, third, fourth, or fifth in their respective groups. Every company is advised by a confidential letter of its own standing in the contest, but no company is advised of the standing of any other company. Special exercises are held at the plant of the winning company when the trophy 'Sentinels of Safety' is formally presented. At the same time a special certificate, signed by the Director of the Bureau of Mines, is given to each employe of the winning plant in recognition of his cooperation which enabled his company to win the trophy. Somewhat similar exercises are held when the National Crushed Stone Association's trophy is presented to the winning company of that association's membership.

"In the first year of the National Safety Competition, the five winning companies had a combined accident rate of 0.22, which signifies that only one-fifth of a day was lost by the men employed at these five plants for each thousand man hours worked. The winners for the second year had a rate of 0.14 and those for the third year had a rate of 0.06. Thus the winners of the second year's contest succeeded in lowering the accident rate 36%, and the winners in the third year lowered it 73%. In the contest of 1925 the winning company in the quarry group was the only one among the five winning companies that operated its plant through the entire year without an accident. Two years later, the contest of 1927 showed that three of the winning plants were operated without an accident; these were the leaders of the quarry group, the metal-mine group, and the nonmetallic mine group. Thus the contest is furthering the cause of safety.

"Nor is the winning of the trophy or the winning of honorable mention the only object to be sought. It is the aim of each company, in the event that it fails to win the chief prize, at least to show an improvement over its previous year's accomplishment not only by reducing its accident rate but also by climbing higher and higher in the scale that represents the relative standing of all of the companies.

"This improvement can be brought about by the constant interest and cooperation of the employes with their companies. And herein lies one of the chief values of a safety contest of this kind. Every employe knows that carelessness on his part may cause his company to lose the trophy, and he is not apt to bring upon his own head the censure or ill will of his fellow workers who are bent upon bringing the coveted honor to their plant. Thus the desire to avoid accidents permeates the entire personnel, and this, in the final analysis, is the surest way to prevent accidents at any plant.

"Can the Sand and Gravel Association protect the workers at the plants of its member companies in any more effective way than by organizing such a safety movement as the National Safety Competition among its entire membership?"

Standard Specifications

The final session of the convention closed with a number of committee reports. Stanton Walker, director of the engineering division, reported for the committee on standard specifications. This committee, he said, was made up of 11 members of the association, and this group was divided into three sub-committees. The first of the three smaller committees studied the situation in regard to standard sizes and standard specifications, the second committee worked on deleterious materials, and the third on test methods.

The sub-committee on standard sizes adopted tentatively six sizes and wrote specifications for these. These specifications will be distributed to the membership during the coming year. Mr. Walker said that some criticism had already been met with in regard to these sizes. He assured the producers present that the sizes named were given as limiting sizes only and not as exact sizes to be met without variation. The reason for this, he stated, was that it would be impossible to meet conditions all over the country but it would be possible for producers to use these limiting sizes as a basis for local specifications.

For the committee on test methods, Mr. Walker reported that the committee had reviewed the methods of such societies as the A. C. I. and A. S. T. M., with a view to adopting one method and procedure for testing. As yet the committee is not ready to recommend the adoption of any one method.

The report of the committee on a standard depreciation scale followed the lines outlined by Mr. Ahearn in his previous report. The committee was working with the Department of Internal Revenue to get such a scale in readiness to submit to all the producers in the industry for approval. It is understood that the adoption of such a scale does not make it obligatory that producers adhere to it, but allows them the privilege of doing so with no other trouble.

The convention business was closed after an extended morning session on the 11th, and no session was necessary in the afternoon. The convention as a whole commended the work of the Cleveland producers and Hal Knight in putting across such a successful program.

Convention Registration

MORE than 350 members, associate members and guests registered at the Cleveland convention. The companies represented and their representatives are given below:

PRODUCERS AND GUESTS

A. & K. Builders Supplies, Inc.—S. S. Keyes, Jamestown, N. Y.

M. W. Allen Construction Co.—John S. Allen, Walpole, Mass.

American Aggregates Corp.—Guy C. Baker, Greenville, Ohio; Fred W. Cornnelle, Cincinnati, Ohio; F. D. Coppock, Greenville, Ohio; Orra Ely, Massillon, Ohio; R. S. Frame, Jr., Greenville, Ohio; C. E. Glander, Greenville, Ohio; F. H. Grant, Detroit, Mich.; J. W. Newey, Chicago, Ill.; C. E. Tuttle, New York City; Earl Zimmerman, Cincinnati, Ohio.

American Road Builders Association—Charles M. Upham, Washington, D. C.

Arrow Sand and Gravel Co.—H. J. Kaufman, Columbus, Ohio; J. L. Marsters, Columbus, Ohio; Stephen Stephanian, Columbus, Ohio.

The Barnes Sand and Gravel Co.—C. M. Ault, Piketon, Ohio.

Charles L. Beck, Millville, N. J.

Birnie Sand and Gravel Co.—J. E. Bowker, North Welbraham, Mass.; C. R. Fairbank, North Welbraham, Mass.

J. B. Blanton Co.—J. B. Blanton, Frankfort, Ky.

Boonville Sand Corp.—H. V. Owens, Utica, N. Y.

Boston Sand and Gravel Co.—Paul P. Bird, Boston, Mass.

Brownelle Sand Co.—J. H. Wagoner, Utica. N. Y.

Buffalo Gravel Co.—R. W. Eberly, Buffalo, N. Y.; H. A. Stelley, Buffalo, N. Y.

Builders Sand Co.—H. E. Donahue, Cleveland, Ohio; P. J. Greeley, Cleveland, Ohio.

M. A. Callahan Co.—David G. Callahan, Cleveland, Ohio; James J. Callahan, Cleveland, Ohio; Norman F. Callahan, Cleveland, Ohio; Nelson J. Callahan, Cleveland, Ohio.

Canada Gravel and Sand, Ltd.—Wm. A. Bennett, Toronto, Ontario, Canada.

J. E. Carroll Sand Co.—J. E. Carroll, Buffalo, N. Y.; John Franz, Buffalo, N. Y.; Edwin G. Spyer, Buffalo, N. Y.; Harry W. Vickery, Buffalo, N. Y.

Central Sand and Gravel Co.—W. W. Fisher, Memphis, Tenn.; John D. Moran, Memphis, Tenn.

L. R. Christie Co.—L. R. Christie, Pittsburgh, Penn.

Charleston Sand and Stone Corp.—R. E. Garrett, Elkton, Ind.

A. J. Clementz Sons—Elmer E. Clementz, Massillon, Ohio; Arthur J. Fritz, Massillon, Ohio.

Cleveland Builders Supply and Brick Co.—M. A. Callahan, Cleveland, Ohio; Mr. Aulenbacher, Cleveland, Ohio; Clarence E. Eble, Cleveland. Ohio.

Columbia Sand and Gravel Co.—W. H. Jordan, Washington, D. C.; L. L. Reeves, Washington, D. C.

Commonwealth Sand and Gravel Co., Inc.—L. G. Thorn, Richmond, Va.; John Twohy, Richmond, Va.

Concrete Materials Corp.—T. E. Rust, Waterloo, Iowa.

Cooley Gravel Co.—C. G. Cooley, Gosport, Ind.; R. E. Long, Gosport, Ind.

J. H. Davidson and Son—J. E. Burke, Pittsburgh, Penn.

J. K. Davison and Bros.—H. S. Davison, Pittsburgh, Penn.; Geo. H. Williamson, Pittsburgh, Penn.

The Day and Maddock Co.—J. J. Moore, Cleveland, Ohio; Wm. T. Walsh, Cleveland, Ohio.

Delaware Sand and Gravel Co.—D. H. Binford, Muncie, Ind.

Dixie Sand and Gravel Corp.—David Alexander, Petersburg, Va.

Dixie Sand and Gravel Co.—Jess Brown, Chattanooga, Tenn.

Dugan, J. N.—J. N. Dugan, Cincinnati, Ohio; Max Zange, Cincinnati, Ohio.

Erie Sand and Gravel Co.—E. S. Williamson, Erie, Penn.
East Liverpool Sand Co.—A. E. Frosch, East Liverpool, Ohio.
Eau Claire Sand and Gravel Co.—A. O. Ayres, Eau Claire, Wis.
Eberts Bros. Co.—Harry W. Eberts, Wyandotte, Mich.
Stanley J. Faus, Royal Oak, Mich.
Flint Crushed Gravel Co.—R. C. Fletcher, Des Moines, Iowa.
General Concrete Products Corp.—A. J. Haggerty, Warren, Penn.
General Material Co.—H. F. Thomson, St. Louis, Mo.
Genesee Gravel Co.—E. J. Proctor, Mt. Morris, Mich.
Georgia Gravel Co.—C. F. Mullen, Columbus, Ga.
Graham and Henderson Co.—M. A. Callahan, Cleveland, Ohio.
Grand Rapids Gravel Co.—Dewey F. Battjes, Grand Rapids, Mich.; Henry N. Battjes, Grand Rapids, Mich.; N. H. Battjes, Grand Rapids, Mich.
Grand Trunk Railroad Co.—J. A. Heman, Detroit, Mich.
Green River Sand Pit—J. E. Irvine, Green River, Wyo.
Hahn Bros. Sand and Gravel Co.—Robert H. Hahn, Muscatine, Iowa; Walter R. Hahn, Muscatine, Iowa.
The T. J. Hall Co.—D. P. Hall, Cincinnati, Ohio; Fred E. Hall, Cincinnati, Ohio.
Hawkeye Material Co.—H. J. Dane, Iowa City, Iowa.
Hercules Cement Corp.—Herbert Coffman, Philadelphia, Penn.
Holmes Sand Co.—W. T. Watson, Millersburg, Ohio.
Richard Hopkins, Troy, N. Y.
Horne Avenue Sand and Gravel Co.—B. A. Downs, Akron, Ohio; B. James Downs, Akron, Ohio.
Huron Portland Cement Co.—John W. Kennedy, Detroit, Mich.
Ideal Sand and Gravel Co.—Wayne A. McGowan, Mason City, Iowa; C. C. Thomas, Mason City, Iowa.
Indiana Gravel Co.—Merritt W. Babcock, Indianapolis, Ind.; Frank J. Billeter, Indianapolis, Ind.; Rollie Hamm, Indianapolis, Ind.; Jesse A. Shearer, Indianapolis, Ind.; Arthur G. Wilson, Indianapolis, Ind.
Iron City Sand and Gravel Co.—George Vang, Pittsburgh, Penn.
Irving Bros. Sand and Gravel Co.—Ralph Irving, Fort Wayne, Ind.; F. W. Irving, Fort Wayne, Ind.; Ray J. Irving, Fort Wayne, Ind.
Jahncke Service, Inc.—W. Charles Jahncke, New Orleans, La.
Janesville Sand and Gravel Co.—J. K. Jenson, Janesville, Wis.
Kansas Sand Co.—Otto Kuehne, Jr., Topeka, Kan.
Kent Sand and Gravel Co.—Ralph Walling, Kent, Ohio.
Keystone Sand and Supply Co.—W. A. Bliss, Pittsburgh, Penn.; J. A. Burke, Pittsburgh, Penn.; Alex W. Dann, Pittsburgh, Penn.; Rowland Jones, Pittsburgh, Penn.; Henry J. Simons, Pittsburgh, Penn.
Lake Shore Builders Supply Co.—H. A. DuBray, Cleveland, Ohio.
Landers, Morrison, Christonsen Co.—Charles H. Young.
Carl Lotz Sand and Gravel Co.—Oscar Lotz, Wausau, Wis.
John T. McHugh, Lakewood, Ohio.
Madison Sand and Gravel Corp.—John G. Carpenter, Hamilton, N. Y.
Douglas Malloch, Chicago, Ill.
Marion Sand and Gravel Co.—W. H. Symes, Marion, Ohio; L. K. Warner, Marion, Ohio.
Massillon Washed Gravel Co.—C. H. Harris, Navarre, Ohio; E. P. Thomas, Navarre, Ohio.
Menantico Sand and Gravel Co.—Hugh Haddow, Jr., Millville, N. J.
Milwaukee Association of Commerce—Earl L. Ferguson, Milwaukee, Wis.
Mineral Products Co.—Joseph R. McGaw, Pittsburgh, Penn.
Mississippi River Sand and Material Co.—Michael Hendy, St. Louis, Mo.; Albert J. Protte, St. Louis, Mo.
Muskingum River Gravel Co.—G. B. Bebout, Zanesville, Ohio; J. S. Sneeden, Zanesville, Ohio; H. D. Stetlion, Zanesville, Ohio.
National Sand and Gravel Association—V. P. Ahearn, Washington, D. C.; W. C. Himmlear, Washington, D. C.; C. E. Proudley, Washington, D. C.; Stanton Walker, Washington, D. C.
New Jersey Sand and Gravel Co.—George House, Ashbury Park, N. J.; David W. Newman, Asbury Park, N. J.
Norman B. Nicoll, Detroit, Mich.
Northern Gravel Co.—E. W. Boynton, Muscatine, Iowa; J. C. Buckbee, West Bend, Wis.; R. D. Keveney, West Bend, Wis.
Northwestern Gravel Co.—H. J. Blink, Lake View, Iowa.
Ohio and Michigan Sand and Gravel Co.—H. C. Ellis, Toledo, Ohio.
Ohio Gravel Ballast Co.—Dan Donnelly, Cincinnati, Ohio.
Ohio River Sand Co.—H. P. Caldwell, Louisville, Ky.; J. M. Settle, Louisville, Ky.
Ohio State Division of Highways—Geo. W. Kerr, Columbus, Ohio.
Ohio Valley Sand Co.—J. W. Harman, New Martinsville, W. Va.
Peck-Thompson Sand Co.—F. W. Peck, Kansas City, Mo.; H. B. Thompson, Kansas City, Mo.
Penn.-Dixie Cement Corp.—J. H. Chubb, New York City.
Petersburg Sand and Gravel Corp.—David Alexander, Petersburg, Va.
Portland Cement Association—Norman Beggs, Chicago, Ill.
Potts-Moore Gravel Co.—C. W. Crisler, Waco, Texas; Robert J. Potts, Waco, Texas.
Queen City Sand and Gravel Co.—Harry P. Lange, Cincinnati, Ohio.
Raritan River Sand Co.—C. E. Dalrymple, New Brunswick, N. J.; J. C. Engel, New Brunswick, N. J.
Ray Sand and Gravel Co.—L. E. Williams, Detroit, Mich.
Ready Mixed Concrete Co.—J. E. Burke, Pittsburgh, Penn.
Rice Sand and Gravel Co.—Carl J. Rice, Minneapolis, Minn.
Theron M. Ripley, County Engineer of Erie County New York, Buffalo, N. Y.
River Sand and Gravel Co.—P. A. Yager, Owensboro, Ky.
Rock Island Sand and Gravel Co.—W. F. Herget, Rock Island, Ill.; J. H. Jackus, Rock Island, Ill.
Rodgers Sand Co.—Phil K. Rodgers, Pittsburgh, Penn.
Roquemore Gravel Co.—J. D. Roquemore, Montgomery, Ala.; J. H. Whigham, Montgomery, Ala.
Rubber City Sand and Gravel Co.—W. H. Harris, Akron, Ohio; L. E. Jacobs, Akron, Ohio; Hal G. Knight, Akron, Ohio; R. H. Orr, East Akron, Ohio; C. L. Turnbull, Akron, Ohio.
St. Louis Material and Supply Co.—Otto S. Conrades, St. Louis, Mo.; F. J. Reinke, St. Louis, Mo.
Schmidt Bros. Sand and Supply Co.—Fred J. Schmidt, Bedford, Ohio.
Seaboard Sand and Gravel Corp.—Harold T. Smith, New York City.
J. L. Shiely Co.—J. L. Shiely, St. Paul, Minn.
Sinten Material and Transport Co.—Ernest B. Sinten, Manchester, Ohio.
Spruce Pine Sand and Gravel Co.—Rose Collins, Spruce Pine, Ala.
Standard Sand and Gravel Co.—W. T. Stump, Wheeling, W. Va.
Steckel Sand Co.—Chas. C. Steckel, Easton, Penn.; C. I. Steckel, Easton, Penn.
Stewart Sand and Material Co.—John Prince, Kansas City, Mo.
Sturm and Dillard Co.—J. H. Adams, Circleville, Ohio; J. H. Evans, Columbus, Ohio; John L. Dillard, Columbus, Ohio; C. H. Purdum, Syracuse, Ind.
Texas Sand and Gravel Producers Association—W. W. Carson, Jr., Austin, Texas.
Toledo Vitrified Brick Co.—W. C. Carlisle, Toledo, Ohio.
Union Sand and Gravel Co.—J. L. Richmond, Huntington, W. Va.
United States Bureau of Mines—W. W. Adams, Washington, D. C.; J. R. Thoenen, Washington, D. C.
United States Chamber of Commerce—Hugh P. Baker, Washington, D. C.; R. E. Logsdon, Memphis, Tenn.
Utah Sand and Gravel Co.—L. T. Mortense, Salt Lake City, Utah; Eric Ryberg, Salt Lake City, Utah.
Charles Warner Co.—R. C. Collins, Philadelphia, Penn.; Alexander Foster, Jr., Philadelphia, Penn.
C. W. Watson, Lorain, Ohio.
Ward Sand and Gravel Co.—E. M. Hammond, Oxford, Mich.; L. J. Dyament, Oxford, Mich.
Wausau Sand and Gravel Co.—T. J. Scott, Wausau, Wis.
Hugo W. Weimer, Milwaukee, Wis.
West Penn Cement Co.—F. B. Lysle, Butler, Penn.
West Sand Co.—H. E. West, Muskogee, Okla.
Wyoming Sandy Stone Co.—Chas. O. Hutchins, Wilkes-Barre, Penn.; J. P. Eyre, Wilkes-Barre, Penn.

Equipment and Machinery Exhibit at the Convention

FIFTY-EIGHT manufacturers of sand and gravel equipment, including also associations and trade papers of the industry, displayed their exhibits in booths especially arranged for them at the Hollenden Hotel. This exhibit, which is the third to be presented at a national sand and gravel producers' convention, exceeded in both size and interest the two preceding exhibits, and was given considerable attention by the producers at the convention. A list of exhibitors and a brief description of their exhibits follows:

The Allen Cone Co., New York, N. Y. Displayed a working model of their sand cone, also catalogs and literature. Represented by E. S. Tompkins and P. Simon.

Allis-Chalmers Mfg. Co., Milwaukee, Wis. Exhibited a working model of their gyratory crusher with Tex-rope drive, also photographs of installations of their crushers, roller bearing motors, pumps and hydraulic equipment in sand and gravel plants. Represented by Abe Goldberg and G. W. Shores.

American Manganese Steel Co., Chicago Heights, Ill. Exhibited their new Type I 2-in. pumps, also a working model of the Swintek ladder equipped with Amsco chain. The company's past years work in the development of hydraulic pump dredges was well illustrated by a series of photographs. Represented by A. W. Daniels, Bradley Carr and Arthur Blakemore.

Barrymore Corp., Cleveland, Ohio. Displayed photographs of several of their "Truckmixed" concrete truck installations in sand and gravel plants. Represented by George Gunn, C. H. Grant and W. M. Carlin.

W. H. K. Bennett Co., Chicago, Ill. Showed a working model of their 12-in. Diamond pump and cutter. Manganese steel dipper teeth, chain, jaw plates and a dredge sleeve were also exhibited. Represented by W. H. K. Bennett and O. W. Anderson of the Pettibone Mulliken Co.

Blaw-Knox Co., Pittsburgh, Penn. Exhibited a cutaway ball bearing sheave used in their "Dreadnaught" bucket. Also large photographs showing ready-mixed concrete plants built by this company. Represented by K. C. Brooks, W. T. Walsh and J. Moore.

Bucyrus-Erie Co., South Milwaukee, Wis. Exhibited a working model of the 120-B Electric shovel using standard controls. Also catalogs and literature of the complete line of shovels, cranes and draglines. Represented by F. O. Wyse, P. M. Richards, C. H. Mann, M. J. Woodhull and P. H. Birckhead.

Bureau of Public Roads, Washington, D. C. Displayed panels showing various phases of their work.

Cement, Mill and Quarry, New York, N. Y. Displayed copies of current issues of their magazine. Represented by E. M. Buck and H. D. Hascall.

Cemroc, Inc., Cincinnati, Ohio. Displayed samples of Cemroc building units, a cement product, also literature. Represented by R. M. Byland and F. L. Ormesher.

The Cincinnati Rubber Mfg. Co., Cincinnati, Ohio. Exhibited samples of their rubber conveyor belting, sand suction hose, dredging sleeves and rubber chute linings. Also installation photographs of their products in sand and gravel plants. Represented by L. P. Darnell, C. M. Young and J. R. Reed.

Cross Engineering Co., Carbondale, Penn. Exhibited samples of their perforated metal and buckets. Represented by W. S. Nicol.

The Dorr Co., New York, N. Y. Exhibited working models of their Dorrco sand washer and the Dorr bowl classifier. Represented by W. B. Geary.

The Dravo Contracting Co., Pittsburgh, Penn. Displayed photographic panels showing their floating and terminal equipment, barges, towboats and sand and gravel dredges. Represented by W. M. Carlin, R. N. Coolidge and R. C. Leigh.

Eagle Iron Works, Des Moines, Iowa. Exhibited working models of their Eagle "Swintek" ladder and Eagle washer. Represented by T. Aulman and C. B. Laird.

Fairbanks, Morse & Co., Chicago, Ill. Exhibited an entire unit ball-bearing motor driven 3-in. centrifugal pump, also panels showing photographs of their line of sand and gravel plant equipment. Represented by G. J. Podlesak, L. C. Allen, G. H. Corlette and T. M. Robbie.

The Fate-Root-Heath Co., Plymouth, Ohio. Showed a panel display of photographs of their locomotives in sand and gravel plants. Photographs of their Diesel locomotive were also shown. Represented by E. W. Heath and J. H. Neofie.

Garst Mfg. Co., Chicago, Ill. Exhibited a ⅝-yd. Garst power plow scraper, also moving pictures of their scraper working in the sand and gravel industy. Represented by G. Garst and J. H. Hutchinson.

General Electric Co., Schenectady, N. Y. An educational exhibit was shown displaying a high frequency furnace—Telsa coil-thyraton with carbon pile control. Also photographs showing G-E equipment in the sand and gravel industry. Represented by J. T. Appleton, L. W. Shugg, W. E. Gluesing, R. Stiner and L. Higgins.

Good Roads Machinery Co., Kennett Square, Penn. Exhibited a working model of their 1030 "Champion" roller bearing crusher, also a working model of the "Champion" sand wash box and photographs of their line of sand and gravel plant equipment. Represented by E. Phillips, J. W. Kitts, M. A. King and R. S. Scott.

Harnischfeger Sales Corp., Milwaukee, Wis. Exhibited a model of their No. 600 P & H shovel, also photographs of the model 900 P & H 3½-yd. Diesel excavator. Moving pictures were shown of P & H equipment operating in the industry. Represented by H. M. Davison, D. J. Murray and P. Strouse.

The Hayward Co., New York, N. Y. Exhibited a working model of a clamshell bucket in operation with a hoist and derrick, also model of their dragline and orange-peel buckets. Represented by H. Ryder and C. S. Sargent.

Hendrick Mfg. Co., Carbondale, Penn. This exhibit featured the new Weston testing screen for testing samples of gravel or stone down to ¼-in. and samples of 25 to 100 lb. in weight. Also showed samples of their corrugated square mesh screen for vibrating screens and samples of flat screens, plates and grating. Represented by Bruce Shotton and D. M. Blackburn.

Industrial Brownhoist Corp., Cleveland, Ohio. Displayed photographs of their cranes working in sand and gravel plants, also their ball bearing conveyor idler. Represented by E. P. Sawhill and George Climo, Jr.

Kensington Steel Co., Chicago, Ill. Displayed Oro manganese steel castings of sprockets with renewable teeth, buckets, drag chain, dipper teeth, crawler parts and other castings. Represented by E. C. Bauer and K. Jensen.

Koppel Industrial Car and Equipment Co., Koppel, Penn. Displayed photographs showing their cars and track equipment. Represented by H. Redman and F. D. Campbell.

A. Leschen & Sons Rope Co., St. Louis, Mo. Exhibited samples of red strand wire rope, sizes ¼ to 2 in. Represented by W. M. Beringer and E. E. Hickok.

Link-Belt Co., Chicago, Ill. Exhibited models of their vibrating screen and Shaw classifier. Also displayed their speed reducer and anti-friction bearing conveyor idlers. Also photographs of sand and gravel plants they have equipped. Represented by C. S. Huntington, A. R. Schifflin, W. W. McKee and H. L. Strube.

Manganese Steel Forge Co., Philadelphia, Penn. Displayed all sizes of "Rol-man" double lock mesh woven manganese steel screens. Also a sample of a fine mesh "Rol-man" double crimped screen with small diameter wire. Represented by L. W. Jones and W. H. Potter.

The Marion Steam Shovel Co., Marion, Ohio. As usual, this company conducted a guessing contest. This year $250 in prizes was offered to the nearest guess of the tensile strength required to break a test bar of Marion 830 steel. First prize was won by J. Steckel of the Steckel Sand Co. Photographs of Marion shovels in sand and gravel work were also displayed. Represented by W. R. Aukland, G. A. Cheney, L. E. Foster, C. A. Gibbons and E. T. Huber.

Mead-Morrison Mfg. Co., Chicago, Ill. Showed photographs of their grab bucket, capstan and drum type caterpillar. Represented by P. B. Redfern.

Morris Machine Works, Baldwinsville, N. Y. Displayed a minature pump and full-sized blueprints of 10- and 12-in. electric dredges. Also installation photographs and bulletins on sand and gravel pumps and hydraulic dredge machinery. Represented by V. J. Milkowski, A. H. Young and F. S. Salchenderger.

National Malleable and Steel Castings Co., Cleveland, Ohio. Exhibited samples of their shovel and dragline chain, also car wheels. Literature and bulletins were displayed. Represented by L. L. McKee and R. R. Root.

National Safety Council, Chicago, Ill. Displayed panels showing many phases of the work they are doing in safety.

The New Jersey Wire Cloth Co., Trenton, N. J. Exhibited samples of screen cloth from 30-mesh to 3-in. size. Also displayed booklets and literature. Represented by G. Medinger, W. E. Foringer, W. F. Mesner and H. R. Kurtz.

Niagara Concrete Mixer Co., Buffalo, N. Y. Exhibited the Niagara roller bearing vibrating screens with the new combination screen panels. A No. 4 three-deck, No. 4 two-deck and No. 2½ two-deck screens were shown. Represented by W. L. Wettlaufer, E. L. Wettlaufer, A. E Owen, S. C. Hodge and H. C. Avery.

Nordberg Mfg. Co., Milwaukee, Wis. Displayed several photographs illustrating the working principle and construction of the Symons disc and cone crusher. Represented by D. Kay, L. D. Hudson and J. M. Thistlewaite.

The Osgood Co., Marion, Ohio. Displayed photographs showing full line of equipment. Represented by E. C. Smith and J. A. McNeal.

The Owen Bucket Co., Cleveland, Ohio. Showed moving pictures of their buckets in operation. Also displayed literature and model buckets. Represented by H. W. Botten and E. W. Botten.

Pit and Quarry, Chicago, Ill. Displayed copies of cement issues of their publication. Represented by W. E. Trauffer and L. M. Weiss.

Pittsburgh Coal Washer Co., Ambridge, Penn. Exhibited their single deck-single unit 3 ft. by 5 ft. 6 in. vibrating screens, also their double tandem screen, 4x10-ft. Both screens are equipped with ball bearings and high pressure lubricating fittings. Represented by E. R. Bollinger and C. R. Galloway.

Productive Equipment Corp., Chicago, Ill. Showed a model of their No. 12 double-deck ball bearing vibrating "Jigger" screen. Sambo, the original black-face "Jigger," was also present to furnish the entertainment. Represented by J. L. Westinhaver.

Robins Conveying Belt Co., New York, N. Y. Exhibited their double-deck 42x72 Gyrex screen. They also displayed their live roll grizzly-rubber idler-rubber sleeved 203X idler. Also literature and photographs. Represented by S. D. Robbins, M. Lambert, E. S. Stadelman and J. F. Meisner.

Rock Products, Chicago, Ill. Displayed the Annual Review and Directory Number for 1928, also copies of current issue. Represented by N. C. Rockwood, H. M. Fitch, W. A. Wilson and Ralph C. Sullivan.

Sauerman Bros., Chicago, Ill. Exhibited a model of a sand and gravel plant for stocking, reclaiming, storage and loading equipped with their slackline Cableway excavator and Crescent power drag scraper. Represented by W. F. Bartholomae, G. H. Tompkins, J. A. Sauerman and F. A. Dement.

Simplicity Engineering Co., Durand, Mich. Exhibited their double-deck 3-ft. by 6-in. ball bearing vibrating screen. Represented by O. B. Uler, G. W. Behnke, F. D. Barber, J. B. Gowr and R. Dunekel.

Smith Engineering Works, Milwaukee, Wis. Exhibited a model sand settling tank, screw rewasher, Ajax washing screen, double-deck vibrating screen. Represented by V. H. Jones and J. R. Norton.

The Stearns Conveyor Co., Cleveland, Ohio. Displayed photographs of installations of their idlers in sand and gravel plants. Represented by L. McKnight, J. C. Merwin, G. M. Dyke, T. E. Cocker and R. Nebel.

Stephens-Adamson Mfg. Co., Aurora, Ill. Exhibited their 455 carrier, Simplex carrier, live roll grizzly, box car loader, Moore bin gate and J. F. S. variable speed transmission, also photographs and literature. Represented by C. H. Adamson and E. J. Patton.

Taylor-Wharton Iron and Steel Co., High Bridge, N. J. Exhibited "Tisco" manganese steel chain, sprockets, dipper teeth, dredge chain. They also showed samples of their new "Tisco Timang" screen for woven wire screens. Represented by J. A. Trainor, A. L. Bray and J. R. Smith.

The Thew Shovel Co., Lorain, Ohio. Displayed photographs of their shovels in sand and gravel plants. Represented by M. B. Garber, J. D. Seltzer and Q. J. Windsor.

The W. S. Tyler Co., Cleveland, Ohio. Exhibited their Type 60 Hum-mer electric vibrating screen. Also samples of wire cloth and screen. Represented by W. J. Piggott, H. P. De Hart, A. E. Reed, G. E. Ellen, W. D. Pringle and H. F. Pierson.

Una-Welding and Bonding Co., Cleveland, Ohio. Exhibited an electric welding machine and rods. Represented by W. J. Bushea.

Universal Crusher Co., Cedar Rapids, Iowa. Exhibited a steel working model ¼ size crusher for gravel. Also photographs of their complete line of crushers and screens. Represented by L. W. Dunlap and E. A. Velde.

Vulcan Iron Works, Wilkes-Barre, Penn. Displayed photographs and literature of their steam and gas locomotives. Represented by J. F. O'Brien and Thomas MacLachlan.

The F. M. Welch Engineering Service, Greenville, Ohio. Displayed drawings of sand and gravel plants designed and built by this company. Represented by F. M. Welch.

Wheeling Mold and Foundry Co., Wheeling, W. Va. Exhibited a 9-ft. by 16-in. roller bearing crusher. Also literature on their other sizes. Represented by William H. Sallwasse.

G. H. Williams Co., Erie, Penn. Displayed literature and catalogs on their complete line of buckets. Also exhibited their new Universal blow torch. Represented by C. F. Weiblen.

Canadian Sand and Gravel

SAND and gravel production in Canada during 1927 reached a new high mark at 22,952,819 tons worth $6,055,601 as against 17,112,798 tons, worth $4,941,434 shipped in 1926.

Imports of sand and gravel into Canada in 1927 were recorded at 289,741 tons and $200,470, while silica sand imported for the manufacture of glass and carborundum and for use in foundries amounted to 148,831 tons, invoiced at $346,138. Exports of sand and gravel totaled 637,627 tons, worth $177,999 in 1927.

Capital employed, including cost of pits, equipment, stock on hand, cash and collectable accounts, by the 483 operators in the sand and gravel industry amounted to $7,668,812. Employes numbered 7,133, comprising 119 salaried employes and 7,014 wage earners. Salaries and wages totaled $2,043,962. Fuel and electricity cost $188,327 including $17,471 for electric power. Primary power employed consisted of 96 units rated at 4,305 hp.

Cement Mills Win More Trophies Than Ever

Finish of Association's 1928 Contest Shows Big Gains

MIDNIGHT, DECEMBER 31, brought to a close the greatest safety contest in the history of the cement mills, with 18 winners of the Portland Cement Association's trophy for a perfect safety record during 1928. Three of these plants had completed two calendar years without accident, and two others passed the two-year mark (although not calendar years), hanging up records never before achieved in the industry. Fifteen more completed a calendar year of safe operation, as many as the total of all prior one year records combined. Seventeen others missed winning the trophy by a single accident, some of them almost by a hair's breadth. Twelve more plants had but two accidents each and another 12 finished the year with only three accidents each.

It is a remarkable accomplishment that 12.25% or almost one-eighth of the cement mills which report their accidents to the Portland Cement Association in 1928 were able to complete the year without a single mishap involving lost time, injury or death to a workman. In 1927 only 7.35% of the operating mills were able to make a corresponding record. In 1926 the proportion was only 1.61%.

The three mills which won the trophy award for two consecutive years will not receive additional trophies, but stone carvers will be sent with instructions to add to the present inscription, "Reawarded for a Perfect Safety Record in 1928," and two delegates of honor from the operating personnel of each mill will be selected to receive the formal award at the spring meeting of the Portland Cement Association. Each of the 15 mills which have won the award for the first time will receive the beautiful hand-cut, cast-stone trophy designed for the association by the Art Institute of Chicago, and will send two delegates to the association meeting to receive the award.

No other award made by the Portland Cement Association is comparable in standing with the association trophy, and the winning mills invariably are the recipients of many local honors. Celebrations are being held at the various mills and later on, when settled weather is assured, the trophies will be unveiled and dedicated in the presence of distinguished gatherings. The prospects of 18 such occasions at the mills during the coming months means that the industry may look forward to a round of public interest such as it has never before.

Winners Well Distributed

Winners of the big contest are located in almost every cement-producing region of the United States, and Canada is represented by one of its western mills. The Lehigh Valley, heretofore a little backward in respect to safety awards, stepped out with four winners in a group of about 25 mills. The Lehigh Portland Cement Co. ran off with all four prizes in this district, but the Hercules, Pennsylvania-Dixie, Lawrence and Atlas company mills led the winners a merry race, and every mill in the valley is actively out after the 1929 award. Michigan, with its many cement plants, secures trophy recognition for the first time through the Alpha mill at Bellevue. The southeastern states find the first trophy awarded in that district going to the Pennsylvania-Dixie mill at Kingsport, Tenn., while the Lehigh mill at Birmingham lost a trophy by one small accident which, however, finally resulted in the loss of an eye. Kansas won two trophies in 1927 and repeats in 1928. Ohio mills, which had never been able to secure a perfect record up to 1927, won one trophy that year and two trophies for the year just closed. Virginia, West Virginia and Missouri each won their first trophy in 1928. The San Antonio mill in Texas won the award a second time, while the west coast states, which received recognition for the first time through the award to the Cowell mill in 1927, witness a "comeback" by Cowell and a perfect record by the Oregon mill at Oswego, Ore. The Universal mill at Duluth had one small accident, the only lost time mishap that has occurred at the plant in about three years.

Some Outstanding Records

Records of a number of the 1928 trophy winners exceed all past experience in cement-mill safety work. The Cowell mill, for example, suffered its last lost time accident on May 11, 1926, and has recorded against it only three accidents since January, 1926. During the previous equal period (three years) this mill suffered a total of only 17 accidents, an extraordinary record measured by general accident experience at that time. The careful attention given this operating feature by the company and mill management is entitled to as much credit as the loyalty of the workmen.

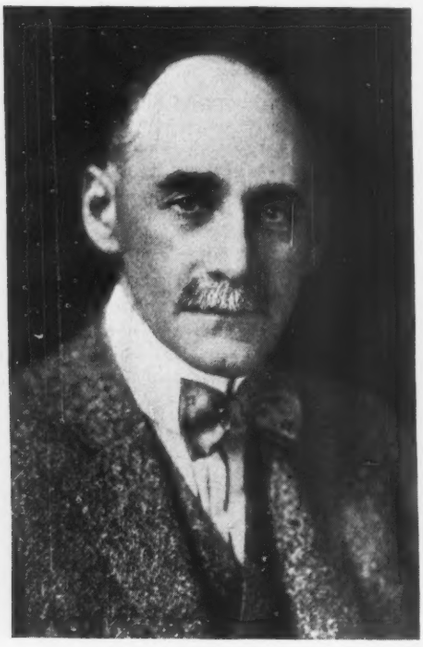
Next in interest is the record of the Lehigh mill at Iola, Kan., where no accident has marred the serenity of the surroundings since September 9, 1926. Since January, 1926, this mill has had but one lost time accident, while during the previous 3-year period there were a total of 17 lost-time accidents. The Ironton mill of the Alpha Portland Cement Co. is deserving of special recognition because it operates a limestone mine, adding considerably to the hazards. During the last three months of 1928 the 550-ft. mine shaft was completely lined with

Presidents of Some of the 1928 P. C. A. Trophy-Winning Cement Companies

G. S. Brown, Alpha

concrete, a very dangerous undertaking, which, however, was safely completed. The Ironton plant had its last accident on December 8, 1926. Since January 1, 1926, it has had seven lost-time accidents as against 53 lost-time accidents for the preceding three-year period.

Out at Mildred, Kan., the Consolidated Cement Corp. organization has had but one accident since December 13, 1926. During the previous two years (1925-1926) the mill



R. P. Butchart, Oregon

Blaine S. Smith, Penn.-Dixie

suffered a total of 86 lost-time accidents. The Bellevue, Mich., plant of the Alpha

Col. E. M. Young, Lehigh

C. C. Jones, Wolverine

Portland Cement Co. had only one accident since November 18, 1926. The record of the two previous years show a total of 27 lost-time accidents. Many other plants have of their accident-free records.

The following table lists the mills winning the 1928 trophy according to the length of their accident-free records.

Mills which suffered only one lost-time or fatal accident during 1928 are as follows:

Bessemer Lime and Cement Co., Bessemer, Penn.

John L. Senior, Consolidated

G. A. Lawniczak

Superintendent, Bellevue (Mich.) plant of the Alpha Portland Cement Co., started work for the German-American Portland Cement Works at LaSalle, Ill., in 1902 as a boy of 17 years. He has been successively, carpenter helper, carpenter, carpenter foreman, construction foreman, mill foreman and superintendent. He has been superintendent of the Bellevue mill for seven years. Mr. Lawniczak has always been an ardent safety booster in the mill and community. He has recently completed a term as mayor of Bellevue.

W. L. Matthes

Superintendent, Manheim (W. Va.) plant of the Alpha Portland Cement Co., entered the Alpha organization on his graduation from Lafayette College in 1916. During the war he was a member of the cement-mill organization operating the French cement plants. Later he was attached to the Alpha mill at Cementon, N. Y., and from 1920 to 1922 was engaged as research engineer for the company. He has been superintendent of the Manheim mill since 1922.

F. C. Brownstead

Superintendent, Ironton (Ohio) p'ant of the Alpha Portland Cement Co., began his work with the cement industry with the opening of this plant in 1901. He served as mill foreman until 1905, and then served in similar capacity with the Pennsylvania Cement Co. until 1909 at which time he returned to Ironton as superintendent.

E. D. Barnett

Superintendent of the Cowell (Calif.) plant of the Cowell Portland Cement Co., graduated from the College of Mines of the University of California in 1912 and after practicing engineering until 1921, went with his present employers as night mill foreman. In February, 1923, he was transferred to engineering work and on August 1 of that year he was promoted to the position of superintendent.

W. D. Armstrong

Superintendent, Exshaw (Alberta) plant of the Canada Cement Co., Ltd., entered the employ of the Canada Cement Co. on his return from over-seas duty in 1920. He was assistant superintendent of the Winnipeg mill of the company from 1920 until 1923, at which time he was appointed superintendent of the Exshaw plant.

Horace H. Heller, Sr.

Superintendent, Bath (Penn.) plant of the Lehigh Portland Cement Co., entered the cement industry in 1901 when he accepted a position as head machinist for the Alpha plant at Martin's Creek. He went to the Bath plant in 1904 as general mill foreman. Later he served as master mechanic of that plant and of the concrete plant of the United Kansas Portland Cement Co. He was appointed to his present position in 1925.

C. E. Caron

Superintendent, Mildred (Kan.) plant of the Consolidated Cement Corp., went with the Great Western Portland Cement Co. at Mildred directly after graduating at Purdue University in 1923 and has held the position of stock-keeper, plant engineer and construction superintendent, being appointed to his present position in 1926.

Raymond A. Moritz

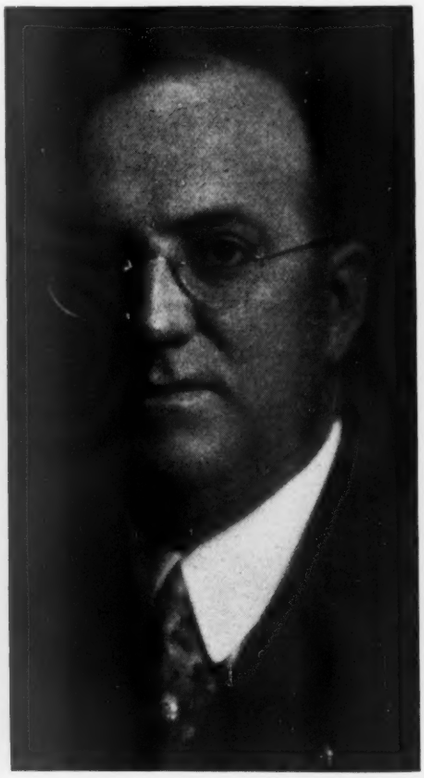
Superintendent, Fogelsville (Penn.) plant of the Lehigh Portland Cement Co., was born into the cement industry and has never worked in any other. He is the son of George Moritz, district superintendent of the Lehigh company. Mr. Moritz started work in 1904 at the Ormrod plant of that company, as a laborer. He was later an apprenticed machinist and several years later became machine shop foreman at Fogelsville and later superintendent.

C. A. Swiggett

Superintendent of the Iola (Kan.) plant of the Lehigh Portland Cement Co., whose modesty has prevented him from providing brief facts concerning his busy career, has the distinction of operating one of the three mills with the longest present safe records—having broken all previous mill records several months ago.

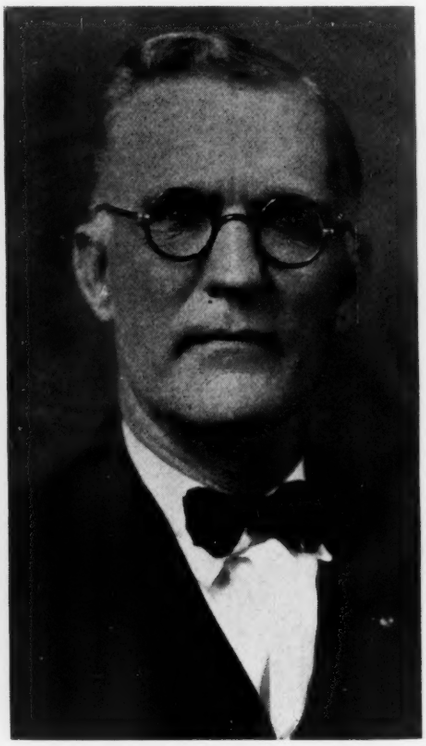
William Montz

Superintendent of Ormrod (Penn.) plant No. 3 of the Lehigh Portland Cement Co., went with Lehigh in 1898 and as master mechanic, helped to build the first mill at Ormrod. In 1900 he assisted similarly in building the second mill at Ormrod and in 1902, with the third mill. In 1908 was appointed superintendent of Ormrod mills No. 2 and 3, which position he holds at present.



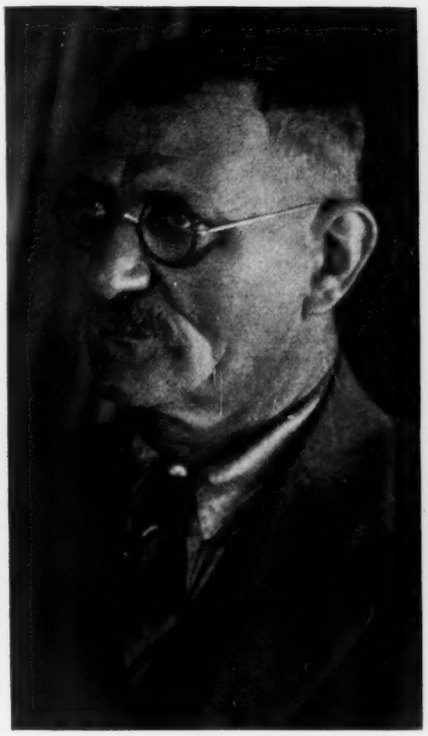
James A. Gish, Jr.

Superintendent of the Sandt's Eddy (Penn.) plant of the Lehigh Portland Cement Co., started his cement career with the engineering department of the Edison Portland Cement Co. in 1901. Since that time he has held important positions with the Bath, United Kansas and Nebraska companies and with Fuller-Lehighand the Fuller Engineering Cos. Mr. Gish has been superintendent of the Sandt's Eddy mill since 1925.



R. C. Matthews

Superintendent, Cape Girardeau (Mo.) plant of the Marquette Cement Manufacturing Co., entered the employ of the Cape Girardeau Portland Cement Co. in 1910 as a millwright and was advanced through the various stages of shift foreman and general foreman to plant superintendent. He was appointed to his present position when the plant was purchased by the Marquette Cement Manufacturing Co. in 1925.



John Dieterman

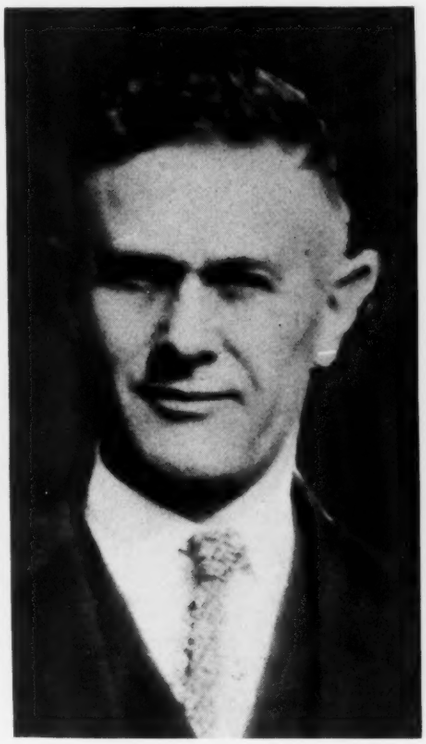
Assistant superintendent in charge of Quincy (Mich.) plant of the Wolverine Portland Cement Co. Experience in the cement industry dates back to 1900 when he entered the employ of the Bronson Cement Co. In 1903 he was employed by the Wolverine Portland Cement Co. and since that time has held the positions of repair foreman, mill foreman and since 1924 assistant superintendent.

O. V. Bartholomew

General superintendent, Trinity Portland Cement Co., made his start with the cement industry at the old Syracuse (Ind.) plant of the Sandusky company in 1902; later with the Cowham system, then constructing a plant at Independence, Kan. Since he has had important construction or operating positions with the Western States, Riverside, Peninsular and Trinity companies. He went to the Dallas plant in 1908, construction foreman, rose successively to assistant superintendent, superintendent and general superintendent in direct charge at Dallas and with supervision over other mills of the company.

Felix Guenther, Jr.

General superintendent, Kingsport (Tenn.) plant of the Pennsylvania-Dixie Cement Corp., after completing post-graduate work at Johns Hopkins, entered the employ of the White Cliffs Cement Co. in 1896 as chemist. During succeeding years he has served as plant manager or general superintendent for the Crescent, Continental, Lehigh, Norfolk and Tidewater companies. In 1918 he went with the Clinchfield company as general superintendent and in 1924 was made general manager. Since the formation of the Pennsylvania-Dixie company, Mr. Guenther has been general superintendent of Plant No. 1.



G. F. Martinez

Superintendent, Norfolk (Va.) plant of the Virginia Portland Cement Corp., has served in important capacities in the operating department of the cement industry for over ten years and has been superintendent at the above plant since 1925.

E. J. Ochs

Superintendent of the Painesville (Ohio) plant of the Standard Portland Cement Co., has been with the cement industry for 25 years, rising from chemist to superintendent. He had 10 years' experience as superintendent in the Lehigh Valley and two years on the Pacific Coast before accepting his present position in July, 1925.

H. R. Shipley

Superintendent, Oswego (Ore.) plant of the Oregon Portland Cement Co., has been with the company since the construction of the plant in 1915. Starting as an oiler on the raw end, Mr. Shipley has risen rapidly through successive stages having been appointed assistant superintendent in 1919 and superintendent in 1927.

Canada Cement Co., Ltd., Hull, Quebec.
Diamond Portland Cement Co., Middle Branch, Ohio.
Hercules Cement Corp., Nazareth, Penn.
Kansas Portland Cement Co., Bonner Springs, Kan.
Lehigh Portland Cement Co., Birmingham, Ala.
Monarch Cement Co., Humboldt, Kan.
Pacific Portland Cement Co., San Juan Bautista, Calif.
Pennsylvania-Dixie Cement Corp., Richard City, Tenn.
Pennsylvania-Dixie Cement Corp., Portland Point, N. Y.
Bittsburgh Plate Glass Co., Zanesville, Ohio.
Sandusky Cement Co., Toledo, Ohio.
Superior Portland Cement, Inc., Concrete, Wash.
Texas Portland Cement Co., Houston, Texts.
Universal Portland Cement Co., Duluth, Minn.
Wabash Portland Cement Co., Osborn, Ohio.
Three Forks Portland Cement Co., Trident, Mont.

Winners of the Portland Cement Association trophies for previous years are as follows:

A. C. Tagge, president of the Canada Cement Co., which owns one of the 1928 prize-winning mills—Mr. Tagge has been one of the foremost workers for safety in the cement industry

WINNING PLANTS AND THEIR SUPERINTENDENTS

Days since last accident	Plant	Company	Superintendent
*966	Cowell, Calif.	Cowell Portland Cement Co.	E. D. Barnett
*845	Iola, Kan.	Lehigh Portland Cement Co.	C. A. Swiggett
*755	Ironton, Ohio	Alpha Portland Cement Co.	F. C. Brownstead
654	Mildred, Kan.	Consolidated Cement Corp.	C. E. Caron
626	Bellevue, Mich.	Alpha Bortland Cement Co.	G. A. Lawniczak
599	Kingsport, Tenn.	Pennsylvania-Dixie Cement Corp.	F. Guenther, Jr.
500	Mainheim, W. Va.	Alpha Bortland Cement Co.	W. L. Matthes
480	Ormrod, Pa., No. 3	Lehigh Portland Cement Co.	Wm. J. Montz
441	Painesville, Ohio	Standard Portland Cement Co.	Erie J. Ochs
407	Exshaw, Alberta	Canada Cement Co.	W. D. Armstrong
402	Dallas, Texas	Trinity Portland Cement Co.	O. V. Bartholomew
395	Bath, Penn.	Lehigh Portland Cement Co.	H. H. Heller, Sr.
384	Fogelsville, Penn.	Lehigh Portland Cement Co.	Raymond A. Moritz
377	Quincy, Mich.	Wolverine Portland Cement Co.	John Dieterman
376	Sandts Eddy, Penn.	Lehigh Portland Cement Co.	James A. Gish, Jr.
374	Cape Girardeau Mo.	Marquette Cement Manufacturing Co.	R. C. Matthews
370	Oswego, Ore.	Oregon Portland Cement Co.	H. R. Shipley
367	Norfolk, Va.	Lone Star Cement Co., Virginia.	G. F. Martinez

*Records exceed two years.

Former Winners

The 13 former winners of the Portland Cement Association safety trophy afford an interesting study of the future effects of these "trophy campaigns." Some of the mills have organized with the expectation that a year's hard work would secure a trophy, win lasting honor and cast a spell which would drive off mishaps in the future. Most of the trophy winners have discovered, however, that even to the mill possessing one of these handsome cast-stone monuments the job of preventing accidents to quarry and mill employes is far from complete.

Of the 13 mills which secured the trophy previously, one had more accidents than the average for all mills in 1928. It must be confessed that this result argues somewhat against the lasting effects of the competition, but in defense of this mill it may be explained that 1928 proved a trying construction period such as may not be experienced again for many years. The accident frequency of the 13 former winners was as follows in 1928:

3 had no accidents.
3 had one accident.
2 had two accidents.
2 had four accidents.
2 had five accidents.
1 had eight accidents.

The former trophy winners had an average of 2.5 accidents per plant in 1928 as compared with the general average of about 7 per plant for all of the mills reporting.

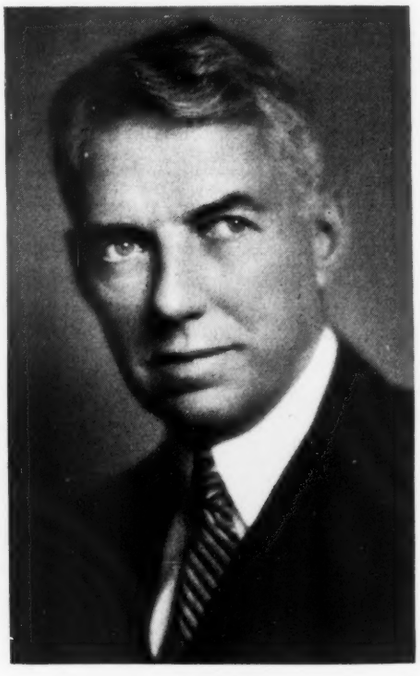
The 1929 Contest

Improvement in the accident situation in the industry as a result of the annual trophy contest has been sufficiently encouraging to warrant continuance, and the 1929 contest, along identical lines, has just been announced. The cement manufacturers have expressed themselves as quite willing to appropriate the many thousands of dollars required to make the trophy awards, feeling that it is money well invested.

John Carmen Eden

JOHN CARMEN EDEN, prominent Pacific Coast manufacturer and business leader, died January 12 at his home in The Highlands, Seattle, Wash. He had been in ill health the past 11 months and recently was able to return to his home from Providence Hospital, where he underwent an operation. He was 64 years old.

The fatal illness manifested itself while Mr. and Mrs. Eden were on a world cruise last February. The tour was abandoned and they returned directly from Java.



John C. Eden

PREVIOUS WINNERS OF TROPHY

Year	Plant	Company	Superintendent
1923	San Antonio, Texas	San Antonio Portland Cement Co.	H. O. Rinehold
1924	Mitchell, Ind.	Lehigh Portland Cement Co.	W. H. Weitknecht
1925	Pt. Colborne, Ont.	CanadaCanada Cement Co., Ltd.	L. M. McDonald
1925	Duluth, Minn.	Universal Portland Cement Co.	R. S. Huey
1926	Ft. Whyte, Man.	Canada Cement Co., Ltd.	J. R. Dowrie
1926	Mitchell, Ind.	Lehigh Portland Cement Co.	W. H. Weitknecht
1927	Martins Creek, Penn., No. 3	Alpha Portland Cement Co.	J. L. White
1927	Ironton, Ohio	Alpha Portland Cement Co.	F. C. Brownstead
1927	Belleville, Ont.	Canada Cement Co., Ltd.	J. H. Legate
1927	Hull, Que.	Canada Cement Co., Ltd.	E. French
1927	Cowell, Calif.	Cowell Portland Cement Co.	E. D. Barnett
1927	Bonner Springs,Kan.	Kansas Portland Cement Co.	L. J. Wheeler
1927	New Castle, Penn. No. 3	Lehigh Portland Cement Co.	W. H. Kleckner
1927	Iola, Kan.	Lehigh Portland Cement Co.	C. A. Swiggett
1927	San Antonio, Texas	San Antonio Portland Cement Co.	H. O. Rinehold
1927	Duluth, Minn.	Universal Portland Cement Co.	R. S. Huey

Foreign Abstracts and Patent Review

Rotary Kiln for Burning Cement. In the burning of cement the resulting heat losses are, as is known, to be traced essentially to the waste gases leaving the kiln at high temperatures. Efforts are therefore being made to utilize the quantities of heat escaping with the waste gases as completely as possible in the kiln, in order to make the combustion process economical in this manner. Now, the greatest demand for heat is in that portion of the kiln, in which the disintegration of the $CaCO_3$ into CaO and CO_2 takes place, therefore in the calcining zone, whereas in the sintering zone only sufficient heat is required to cover, when necessary, an excess in conduction and radiation losses as compared to the heat formed in the cement clinker. As is known, the disintegration of $CaCO_3$ starts at about 900 deg. C. (1652 deg. F.), and according to experience is concluded in the rotary kiln only at 1110 deg. C. (2012 deg. F.). Thus the waste gases of the calcining zone, which contain besides the waste gases of combustion also the liberated and hot CO_2 gas, suffice to cover the heat requirement of the preheating zone of the kiln. From this train of thought comes an invention in which the cross-section of the kiln is narrowed in such a way that the beginning of the narrowed zone, which is exposed to the entrance of the flames, is situated inside the calcining zone. Rotary kilns for the burning of cement which have a narrowing of the kiln cross-section are in themselves known. Thus a rotary kiln with enlarged diameter is provided with a special narrowing between the sintering and calcining zone, in order to attain a high temperature in the sintering zone. But since the sintering reaction gives off heat in itself, and since a strong heat-requiring reaction takes place in the calcining zone, such a narrowing meets in no way with the above demands. In another well-known rotary kiln the congestion, due to the reduced diameter, takes place at the border between the calcining and the preheating zone, so that the increase in temperature is greatest in the last part of the calcining zone, in respect to the direction of passage of the combustion gases. The congestion occurs then towards the beginning of this zone and in most cases does not enter at all into the lower part, in which the greatest heat requirement prevails, since here the fuel must be heated to 1100 deg. C. (2012 deg. F.). A complete calcination is therefore not possible. In another well-known rotary kiln a stream of air is introduced under high pressure above the sintering zone in such a way that it meets the flow of the fuel head on. Thereby a curtain of air is formed, which effects a retarding of the velocity of the heating gases. Due to the congestion at the border between the sintering and the calcining zone, which under the action of the air stream extends far into the sintering zone, a considerable excess of heat is produced, which is detrimental to the sintering. According to the invention described, the above-mentioned drawbacks are avoided in this way, that the congestion takes place within the calcining zone and preferably in its center, or at a somewhat greater distance from the sintering zone, so that this zone itself is not affected by the congestion. Therefore, on one hand no storage of excess heat, which would retard the process, takes place in the sintering zone, and on the other hand the development of heat effected by the congestion is greatest in that part of the calcining zone which faces the entrance of the flames, in which prevails actually also the greatest heat requirement. — *German Reich Patent* No. 451,468.

Calcium Alloy for Producing Light or Porous Concrete. Prof. T. Meyer reports concerning the various processes for the production of gassed-concrete, in which gas-producing activators are added to the concrete mix, resulting in a porous concrete. Whereas Meyer does not see a suitable means in the use of aluminum powder, in contrast to the experiences obtained in Scandinavia, since this would produce irregular porosity, fluctuating volume weight and excessively low strengths, he describes his process for using alloys of high calcium content. In favor of his method he notes: High compressive strength of the concrete (70 kg. per sq. cm. or 996 lb. per sq. in.), uniform pore formation, and also a volume weight which can be regulated according to the mix, such as the addition of activators. Moreover, the calcium alloy reacts only with water to make generation of gas, whereas by the use of aluminum the latter reacts with the lime of the cement in the presence of water, and thus impairs the lime in its action. In fact, it cannot therefore be claimed that aluminum powder is unusable, since the experiments of Platzmann, carried out in a laboratory and reported in Rock Products, 1923, and also the practical work carried out since then have proved the contrary.—*Die Chemische Fabrik* No. 27 (1928), pp. 403-404 and No. 29 (1928) pp. 433-435.

Behavior of Trass Cement in Sulphate Waters. A trass cement in which the portland cement was ground with trass was mixed in 1:3 proportion with standard sand and exposed to the influence of a 2.5% magnesium sulphate solution. During the observations, extending over three years, it was found that the test specimens immersed completely in the solution remained in faultless condition; but that considerable deterioration was evident in the partly immersed test specimens on those parts which remained outside of the solution. Test samples which after 2½ years, during which they were completely covered with the solution, were still faultless also showed appearances of destruction after they had been exposed another half year to the solution, but only half immersed. As a practical evaluation, the conclusion was that trass cement may be declared to be resistible in a high degree to the water which contains sulphates. The difference in the behavior of the test samples immersed completely in the sulphate liquid and of those partly immersed; that is, half in the solution and half in the air, shows again the importance of the protection particularly of those parts of concrete works located outside of the sulphate waters, into which the solution enters by capillary action and by evaporation closes the pores, filled to capacity, with the harmful matter. The required protection of the parts of concrete works exposed to the air can be effected perhaps in no other way than by an impervious coating which prevents the evaporation of liquids beneath the coating and thereby sets up a barrier to its concentration and crystallization in the texture of the concrete.—*Tonindustrie-Zeitung* No. 521 (1928), pp. 1058-1060.

Heat Balance in Rotary Cement Kilns. In the average rotary cement kiln, 200 ft. long and 9 ft. internal diameter, giving an output of 1100 tons of clinker per week from a slurry containing 38% of moisture and a coal of 12,600 B.t.u./lb., the coal consumption is about 28% of the clinker produced and the temperature of the flue gases about 420 to 430 deg. F. and of the clinker discharge about 310 to 320 deg. The heat introduced to such a furnace is distributed as follows: From the coal 92%, from the exothermic action 4.75%, and from the sensible heat of the constituents of the charge 3.25%. The heat expended is utilized as follows: In evaporating slurry water and superheating 40%, in decomposing carbonate 24.5%, in flue gases 20%, in clinker discharge 3%, and in radiation 9%, leaving 3.5% unaccounted for. A slight excess of air over the theoretical is necessary for economical working; too large an excess or a deficiency of air leads to a higher coal consumption. Accurate control of the kiln is obtained by installing recording pyrometers in the flues and clinker-discharge outlet, and by frequent analysis of the flue gases, which should contain 1% to 2% of oxygen.—H. Pooley, Jr., in *Engineering*, 1928, 126, pp. 219-220.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF LIMESTONE FLUX

District	Week ended Dec. 1	Dec. 8	Dec. 15	Dec. 22
Eastern	2,293	2,450	2,410	2,295
Allegheny	2,526	3,073	3,003	3,121
Pocahontas	276	330	328	241
Southern	489	608	554	561
Northwestern	741	737	521	577
Central Western	454	416	450	430
Southwestern	352	347	271	317
Total	7,131	7,961	7,537	7,542

CAR LOADINGS OF SAND, GRAVEL AND STONE

District	Week ended Dec. 1	Dec. 8	Dec. 15	Dec. 22
Eastern	5,292	4,551	3,884	2,707
Allegheny	4,741	4,458	4,077	3,041
Pocahontas	734	710	529	371
Southern	8,765	9,556	9,135	7,048
Northwestern	3,289	2,167	1,582	1,271
Central Western	7,074	6,258	5,227	5,395
Southwestern	6,267	6,121	4,949	4,541
Total	36,162	33,821	29,383	24,374

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

District	Limestone Flux 1927 Period to date Dec. 24	1928 Dec. 22	Sand, Gravel and Stone 1927 Period to date Dec. 24	1928 Dec. 22
Eastern	161,986	149,160	537,311	552,505
Allegheny	176,630	174,257	415,023	373,304
Pocahontas	24,827	22,893	47,613	41,185
Southern	29,340	29,760	608,445	535,352
Northwestern	63,755	64,350	345,484	321,336
Central W'n	24,588	22,717	475,326	505,258
Southwestern	19,042	20,554	296,331	321,138
Total	500,168	483,691	2,725,533	2,650,078

COMPARATIVE TOTAL LOADINGS, 1927 AND 1928

	1927	1928
Limestone flux	*500,168*	*483,691*
Sand, stone, gravel	*2,725,533*	*2,650,078*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning January 12:

SOUTHERN FREIGHT ASSOCIATION DOCKET

43480. **Sand,** from Crossley, Fla., to Clarksburg, W. Va. Combination rate of 728c per net ton now applies. Proposed rate on sand (common), carloads (see Note 3), from Crossley, Fla., to Clarksburg, W. Va., 667c per net ton. Based on Richmond, Va., combination, using beyond Richmond proportion acceptable to the eastern lines.

43484. **Flint or quartz rock,** from Norman, N. C., to eastern points, etc. It is proposed to establish the following reduced rates on: Flint or quartz rock, crude or ground, in bags or bulk, carloads, minimum weight 100,000 lb. (when 90% of marked capacity is less than 100,000 lb., such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity the actual weight will govern, from Norman, N. C. Rates in cents per ton of 2000 lb.

To—	
Trenton, N. J.	515
East Liverpool, O.	665
Philadelphia, Penn.	415
Wilmington, Del.	415
New Castle, Penn.	695
Newell, Penn.	665
Springfield, Mass.	695
Williamsport, Penn.	665
Lewiston, Penn.	665
Laughlin, O.	665
Beaver Falls, Penn.	665
New York, N. Y.	605
Jersey City, N. J.	515
Troy, N. Y.	695
Norfolk, Va.	195

43503. **Sand,** from Sand Pit, Va., to Scotland Neck, N. C. Present rate, 165c per net ton. Proposed rate on sand, carloads, minimum weight, 100,000 lb. (when 90% of marked capacity is less than 100,000 lb., such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity the actual weight will govern, from Sand Pit, Va., to Scotland Neck, N. C., 150c per net ton. Proposed in order to meet competition of shippers at other sources.

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

43571. **Asbestos ore or rock,** from Micaville, N. C., to Gainesville, Ga. Present rate, 51c per 100 lb. (sixth class). Proposed rate on asbestos ore or rock, carloads, minimum weight 80,000 lb., from Micaville, N. C., to Gainesville, Ga., 300c per net ton.

43577. **Limestone or white stone,** from Jacksonville, Fla. (when from beyond), to F. E. C. Ry. stations. Class rates now apply. It is proposed to establish rates on limestone or white stone, ground or pulverized, carloads, minimum weight 60,000 lb., from Jacksonville, Fla. (when from beyond), to F. E. C. Ry. stations, made in line with rates to stations on other roads for similar distances. Representative rates are as follows: To St. Augustine, 120c; Daytona Beach, 160c; Titusville, 180c; Cocos, 190c; Vero Beach, 205c, and to Fort Pierce, Fla., 210c per net ton.

43584. **Crushed stone,** from Boxley, Va., to Hopewell, Va. It is proposed to establish commodity rate of 120c per net ton on crushed stone (see Note 3), from Boxley, Va., to Hopewell, Va., made on basis of local mileage scale of the N. & W. Ry. as per N. & W. Ry., I. C. C. No. 8056. Petersburg combination of 150c per net ton applies at present.

SOUTHWESTERN FREIGHT BUREAU DOCKET

16325. **Limestone,** from White Cliffs, Ark., to points in Oklahoma and Texas. To establish mileage scale of rates on ground limestone, carloads, minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb., marked capacity will govern, from White Cliffs, Ark., to points in Oklahoma and Texas, the same as now applicable in 9702 territory under Item 1045, Column 1, S.W.L. Tariff 114C. Shippers state that they desire an equitable basis of rates on this traffic and feel that a basis which will not exceed the figures carried in the 9702 scale are reasonable.

16377. **Sand,** from Missouri and Kansas points to Sandstone, Minn. To establish rate of 19½c per 100 lb. on sand and chatt, carloads, minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb., marked capacity will govern, from Joplin, Webb City, Oronogo, Cartersville, Smithfield, Carl Junction, Mo., and Galena, Kan., to Sandstone, Minn. Shippers point out that there are no through commodity rates to Sandstone, Minn., and feel that Granite Falls, Minn., rate should be established to that point.

16389. **Dolomite,** from St. Louis, Mo., to points in Oklahoma. To establish rate of $3.50 per ton of 2000 lb. on roasted dolomite, carloads, minimum weight 60,000 lb., from St. Louis, Mo., East St. Louis and Granite City, Ill., to Tulsa and Sand Springs, Okla. A new steel plant now under construction in the Tulsa-Sand Springs district will soon be completed and will require a large amount of roasted dolomite before they can commence operation. Interested shippers state that the traffic cannot be moved on present class basis.

16506. **Limestone,** from Weeping Water, Neb., to points in Oklahoma. To establish a distant scale of rates on limestone, crushed or ground, carloads (See Note 2), except when weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will apply. In no case will the minimum weight be less than 40,000 lb., from Weeping Water, Neb., to points in Oklahoma, on the basis outlined below: Under W. T. L. Docket Advice No. 496-L, the proposed scale to and including 500 miles has been proposed for application from Weeping Water, Neb., to points in Kansas. It is desired that this scale be extended to 750 miles to points in Oklahoma. The proposed scale for mileages up to and including 500 miles represents the Nebraska to Kansas single line scale with an additional differential of 1c per 100 lb. over two lines and a differential of 1½c when movements are via three or more lines.

WESTERN TRUNK LINE DOCKET

1564-Q. **Stone, crushed,** carloads, usual minimum weight, from Dell Rapids, S. D., Sioux Falls, S. D., Quartzite, Minn., Ablemans, Berlin, Liberty Bluff, Lohrville, Mayville, Montello, Neshkoro, Spring Lake, Red Granite, Stevens Point, Utley and Waupaca, Wis., to Burlington and Keokuk, Iowa. Present—Rates range from 11 to 12c. Proposed—13c.

6741. **Sand,** carloads, from New London, Mo., to various stations in Illinois on Wabash Ry. Present—Combination basis. Proposed:

To	Per N. T.	To	Per N. T.
Quincy	90	Baylis	110
Shepherds	90	New Salem	110
Aladdin	90	Pittsfield	110
Spencers	90	Maysville	110
Hulls	90	Griggsville	110
Kinderhook	110	Valley City	110
Magner	110	Pineland	110
Barry	110	Naples	110
Hadley	110	Bluffs	110
Arden	110		

6751. **Sand and gravel,** carloads, from Eau Claire, Wis., to Colo. common points as named in Item 9200, W. T. L. 111 series. Present rates, class; proposed, 34½c per 100 lb.

6753. **Limestone, crushed or ground,** carloads (See Note 3), but not less than 40,000 lb., from White Bear, Mo., to points shown below (per 100 lb.):

To	Pres.	Prop.
Lincoln, Neb.	15½	11½
Omaha, Neb.	13½	11½
South Omaha, Neb.	13½	11½

353-I. **Sand,** carloads (See Note 2), but not less than 40,000 lb., from Bay City, Wis., to Toledo, O. Present rate, $4.04 per net ton; proposed, $3.73 per net ton, the same as now in effect to Detroit, Mich.

CENTRAL FREIGHT ASSOCIATION DOCKET

20346. To establish a rate of 143c per net ton on **crushed stone,** carloads, the Bedford district, to following stations on the Evansville Suburban & Newburgh Ry.: Barnetts, Ind., Boonville, Ind., Chandler, Ind., Epworth, Ind., Evansville, Ind., Garvin, Ind., Korffs, Ind., Lants, Ind., Mitchem, Ind., Newburgh, Ind., Newburgh Road, Ind., Stacers, Ind., Stephenston, Ind., Woodmere, Ind., Worsham Mine, Ind. Present rates—Combination rates apply.

20381. To establish on **crushed stone,** carloads, Carey, Rimer, Findlay, Lima, Bluffton, Arlington and Lewisburg, O., to Celina, Coldwater, Ft. Recovery, New Bremen and Minster, O., following present and proposed rates in cents per net ton:

FROM CAREY TO

	(N. O.) Pres.	Prop.
Celina	70	95
Coldwater	70	100
Ft. Recovery	70	100
New Bremen	70	95
Minster	70	95

FROM RIMER TO

	(N. O.) Pres.	Prop.
Celina	70	95
Coldwater	70	95
Ft. Recovery	70	100
New Bremen	70	95
Minster	70	95

FROM FINDLAY TO

	(N. K. P.) Pres.	Prop.
Celina	70	90
Coldwater	70	95
Ft. Recovery	70	100
New Bremen	70	90
Minster	70	90

FROM LIMA TO

	(N. K. P.) Pres.	Prop.
Celina	60	75
Coldwater	60	80
Ft. Recovery	70	85
New Bremen	60	70
Minster	60	75

FROM BLUFFTON TO

	(N. K. P.) Pres.	Prop.
Celina	60	85
Coldwater	60	85
Ft. Recovery	70	90
New Bremen	60	80
Minster	60	85

FROM ARLINGTON TO

	(N. O.) Pres.	Prop.
Celina	70	90
Coldwater	70	95
Ft. Recovery	70	95
New Bremen	70	90
Minster	70	90

FROM LEWISBURG TO

	(C.N.) Pres.	Prop.
Celina	60	85
Coldwater	60	85
Ft. Recovery	....	....
New Bremen	....	....
Minster	....	....

(b) From East Liberty to New Bremen and Minster, O., rate of 90c per net ton. Present rate—70c per net ton.

20390. To establish on **gravel and sand,** carloads, Akron, O., to Macedonia, O., rate of 60c per ton of 2000 lb. Present rate—70c per ton of 2000 lb.

20391. To establish on **loam sand,** carloads, Follansbee, W. Va., to Wheeling, W. Va. Rate of 76c per ton of 2000 lb. Present rate—9½c.

20467. To establish on **sand,** viz., **blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica,** in carloads, from Bremen, Glass Rock, Glenford, New Lexington, Rushville, South Zanesville, Thornville, Yost and Zanesville, O., to Union Furnace, O., rate of 80c per net ton. Present rate—140c per net ton.

20458. To establish on **rubble, rip rap and quarry, scrap stone,** carloads, Lisbon, O., to Ohlton, O., rate of 76c per ton of 2000 lb. Present rate—210c per ton of 2000 lb.

20470. To establish on **crushed stone,** carloads, Lewisburg, O., to stations on the Penna. R. R., rates as shown below (in cents per net ton):

To—	Proposed Rate
Eldorado, O.	85
New Paris, O.	85
Richmond, Ind.	85
Centerville, Ind.	95
Germantown, Ind.	95
Cambridge City, Ind.	95
Dublin, Ind.	105
D. and J. Tower, Ind.	105
Straughn, Ind.	105
Lewisville, Ind.	105
Dunreith, Ind.	105
Knightstown, Ind.	105
Charlottsville, Ind.	115
Cleveland, Ind.	115
Greenfield, Ind.	115
Philadelphia, Ind.	130
Gem, Ind.	130
Cumberland, Ind.	130
Irvington, Ind.	130
Indianapolis, Ind.	130

Present rate—Sixth class.

20478. To establish on **sand, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica,** carloads, from Utica, Penn., to Bucyrus, O., rate of 214c per ton of 2000 lb. Present rate—420c per ton of 2000 lb.

20479. To establish on **raw or crude dolomite,** carloads, Carey and McVitty's, O., to Toledo, O., rate of 65c per gross ton. Present rate—101c per gross ton.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4847. **Sand and gravel** (not molding nor silica), carloads, from Gladstone, Ill., to stations on M. & St. L. Ry., A. T. & S. F. Ry. and T. P. & W. R. R. (To representative points.)

	Present	Proposed, Per ton
A. T. & S. F. Ry.—		
Princeville	10½	$1.00
Galesburg	8	1.00
Ormonde	8½	1.00
Lomax	6	1.00
Dallas City	6½	1.00
M. & St. L. Ry.—		
Seaton	7½	1.00
Nemo	8½	1.00
Abingdon	9½	1.00
Rapatee	10	1.00
T. P. & W. R. R.—		
Civer	10	1.01
Bushnell	2½	1.01
La Harpe	8	.88
Disco	6	.88

TRUNK LINE ASSOCIATION DOCKET

20068. **Crushed stone,** carloads (see Note 2), from Steelton to Marysville, Penn., and from Steelton and Lemoyne to Kinkora Heights and Duncannon, Penn., 70c per net ton. Reason—Proposed rates are fairly comparable with rates on like commodities from and to points in the same general territory.

20073. **Ground limestone,** carloads, minimum weight 50,000 lb., from Blakeslee, N. Y., to Lehigh Valley R. R. stations, Willow Creek, Gilbert, Yale, Geneva, Pre-Emption, Middlesex, Half Acre, McGraw, N. Y., and various, rates ranging from $1.20 to $1.40 per net ton. Reason—Proposed rates are fairly comparable with rates from Buffalo, N. Y., to Seneca Falls, Naples, Ithaca, Van Etten, N. Y., etc.

20075. **Sand** (other than blast, engine, filter, foundry, glass, molding, quartz, silex or silica) **and gravel** (other than molding gravel), carloads (see Note 2), from sand shipping points in southern New Jersey, Cape May, Dennisville and Palermo, N. J., to Philadelphia, Penn., $1.10 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

20082. **Stone, natural** (other than bituminous asphalt rock), crushed, N.O.I.B.N. in open cars, carloads (see Note 2), from Avis, Penn., to Carnwath and Madera, Penn., $1.25 per net ton. Reason: Proposed rate is fairly comparable with rates now in force on like commodities from and to points in the same general territory.

20106. **Sand,** carloads (see Note 2), but not less than 40,000 lb., from Albany, N. Y., rate points to Shakopee, Minn., 31½c per 100 lb. Reason—Proposed rate is fairly comparable with rate to St. Paul, Minn.

20117. (a) **Sand** (other than blast, engine, glass, silica, silex, quartz, molding or foundry sand) and **gravel,** carloads; (b) **sand, blast, engine, glass, molding, silex, quartz, silica or foundry,** carloads (see Note 2), from Pinewald, Toms River and Quail Run, N. J., to P. R. R. points, Maryville, Mt. Union, Tyrone, Portage, Lewistown, Penn., Perryville, Md., and various, (a) rates ranging from $2.05 to $2.75 per net ton, (b) rates ranging from $2.30 to $3.10 per net ton. Reason—Proposed rates are same as rates now in force from Newport, N. J., to same points.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

15908. **Limestone,** from North Adams, Mass., to New York, N. Y., 11½c; to Brooklyn, N. Y., and New York lighterage points, 14c, via Troy, N. Y., and N. Y. C. R. R. Reason—To meet carrier competition.

15940. **Molding sand,** carloads (see Note 3), from Elnora, Reynolds, Schaghticoke, Schuylerville, Scotia, Saratoga Springs, Stillwater, Wayville and Ushers, N. Y., to Waynesboro, Penn., 18c. Reason—To grant shippers a commodity rate comparable with other commodity rates now in effect.

15946. **Sand, blasting, core, fire and sea,** carloads (see Note 2), from Davisville, R. I., to Brooklyn Contract Terminals, 17c. Reason—To provide a rate comparable with that in effect to Harlem River, N. Y.

TRANSCONTINENTAL FREIGHT BUREAU DOCKET

9539. **Magnesite,** C. L., E. B.: Request for amendment of Tariff 2W (I. C. C. No. 1206, H. G. Toll, agent) to provide for rate of 54c per 100 lb. on magnesite, carloads, from the North Pacific coast to Birmingham, Ala. (Group "C").

Cement Arbitraries

THE Commission, by division 1, in No. 16845, Iola Cement Mills Traffis Association et al. vs. Alabama & Vicksburg et al., in a report written by Commissioner Eastman, upon further consideration, has modified its findings in the original report, 144 I. C. C. 585, so as to award an arbitrary of 2 cents per 100 lb. to a list of railroads found to be short or weak lines entitled to higher revenue than would accrue by the application of the rates in the cement scale prescribed in that case. This report also embraces seven sub-numbers.

In the original report the Commission prescribed rates on cement from mills in the Kansas gas belt, and at Ada, Okla., Eagle Ford, Harry and Houston (Manchester), Tex., Hannibal (Ilasco), and Marquette, Mo., Birmingham, North Birmingham, Spocari, Leeds and Ragland, Ala., Portland, Ga., Chattanooga, Nashville and Richard City, Tenn., and Kosmosdale, Ky., to points in Louisiana, Arkansas, Mississippi, and Tennessee. The weak lines found to be entitled in this report to the additional arbitrary not exceeding 2 cents per 100 lb., are the following: Alabama, Tennessee & Northern Railroad Corp.; Batesville Southwestern (Estate of R. J. Darnell, Lesee); Columbus & Greenville; DeKalb & Western; Fernwood, Columbia & Gulf; Garyville Northern Co.; Gulf, Mobile & Northern; Kosciusko & Southeastern; Louisiana Southern; Mississippi & Alabama; Mississippi & Western; Mississippi Central; Mississippi Export Railroad Co., Mississippi Southern; Natchez, Columbia & Mobile; New Orleans, Natalbany & Natchez; Pearl River Valley, and Sardis & Delta.—Traffic World.

Reparations Awarded Cement Block Company

REPARATIONS of $1,358.67, together with accrued interest of $192.66, were awarded to the Practical Cement Block Co., of Indianapolis, by the public service commission for alleged freight overcharges on sand and gravel hauled by the Pennsylvania railroad on its own and other lines in recent years.

The order said that the railroad company, between August 25, 1924, and June 30, 1928, charged the complaining company $4,826.72 freight on 154 carloads of sand and gravel hauled from the Brown-Hofstetter Sand Co. and that the proper charges would have totaled $3,660.71. The order closed a case begun by the Practical Cement Block Co. and the Indianapolis Chamber of Commerce several months ago against the Pennsylvania and the C. C. C. & St. L. railroads, in which the commission some time ago held existing freight rates on sand and gravel unreasonable and unlawful.—*Indianapolis* (Ind.) *News.*

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Central Mixing Plants for the Manufacture and Sale of Ready Mixed Concrete

A Paper Read at the National Sand and Gravel Association's Convention

By Norman Beggs

Structural and Technical Bureau, Portland Cement Association

DUE to the wide interest being shown in central concrete mixing plants, the National Sand and Gravel Association has requested me to read a paper on the subject before this meeting. This paper is the result of a study of central concrete mixing plants in the mid-western and eastern states. The Portland Cement Association is not promoting central plants, but is glad to assist persons interested in such a business, by giving them the benefit of our experience in the problems of making concrete according to approved practices, and to assist them in any problems they may have to the accomplishment of this end.

In the last few years new central mixing plants for the manufacture and sale of ready mixed concrete have been established in all parts of the country. In 1925 the Portland Cement Association had a list of 25 existing plants. If a similar list were to be compiled today it would contain the names of nearly 100 concerns actually making and selling ready mixed concrete. This shows the recent growth of the industry, in an indication that this class of concrete is being favorably received in many localities and is a promise for the future. Although certain imperfections still remain in the manufacture and delivery of ready mixed concrete, the development that follows will tend to remove these difficulties and approach the ideal method of producing high quality concrete.

Selection of Site for New Plant

The first consideration in establishing a central mixing plant is the selection of a suitable location. It should be chosen keeping in mind these three main points: First, Proximity to the supply, and transportation for bringing in concreting materials, second, probable market for ready mixed concrete, and third, nature and volume of vehicular traffic. The ground area should be of sufficient size to accommodate the mixing plant and to store a large quantity of materials. A well designed layout will eliminate the chance of a shutdown at a time when continuous operations are necessary.

Often a material dealer goes into the business of making and selling ready mixed concrete. He usually selects a part of the existing material yard as the plant site. This arrangement approaches the ideal, because it combines a supply of aggregates at all times with an established and going business and utilizes ground which ordinarily would be idle or at least not put to its maximum utility. A plant built either at the material yard or adjacent to it has an economic advantage as well as the assurance of a constant supply of aggregates. The superiority of a water front site should not be overlooked where economy afforded by using barges for bringing in materials is a factor.

Capacity of the Plant

Although difficult to determine, the probable demands on a new central mixing plant should be carefully estimated before construction plans are approved. For quantities up to 150 cubic yards of concrete per day, a 1-yd mixer will ordinarily take care of the work. Should a daily production of 250 to 300 cu. yd. be desired, a mixer of 1½ yd. capacity is advisable. Where plants are designed to handle up to 800 cubic yards of concrete a day, a 3-yd. mixer should be used. With greater capacities it probably will be found desirable to install two 3-yd. mixers and operate both of them rather than to plan on a single mixer of a larger size.

Most plant owners agree that the capacity of the mixer and the capacity of the truck for hauling should be the same. If a difference must exist, the mixer should be one-half or one-third the truck rating. Under these conditions a batch will be one-third, one-half, or a complete load, the latter being the most favorable arrangement. A minimum amount of time is needed for loading a truck when a single charging of the mixer makes an entire load of concrete. The batch may be started as the empty truck, returning from a job, approaches the plant. By the time the driver checks in, receives instructions for his next trip, has the truck washed, and drives to the loading position, the concrete is thoroughly mixed. His truck is entirely filled by a single batch and he starts for the job immediately. There is no waiting for the second part of the load to be mixed such as is necessary if the mixer capacity is only one-half that of the truck. Most trucks are limited to not more than three yards of concrete, this restriction being placed by a city ordinance providing a maximum load on the streets. The balance of the plant equipment should be designed to prevent tie-ups and delays on account of lack of materials. Any of the large machinery companies will furnish estimates and suggested layouts for plant design.

Building facilities, besides the mixing plant itself, should provide for a plant office, a warehouse for the storage of cement, a garage and a machine shop. It is desirable also to have space set aside for laboratory work where aggregates can be tested and concrete cylinders made and stored. Arrangements for the actual breaking of test cylinders can usually be made with some local laboratory equipped with a suitable testing machine.

Construction of Plant

The gravity type of central mixing plant is the most common form of construction. It is built with overhead storage bins for materials which discharge by gravity into weight batchers that in turn empty into the charging hopper of the mixer. The mixer, sufficiently elevated, dumps directly into the trucks. Most of the plants in existence are designed according to these principles, but there may be certain variations in this plan.—For example, one large plant visited proportions materials by weight at one location, hauls these dry batches in flat bottom trucks a few hundred feet, and dumps them directly into the mixer hopper. Sacked cement is used and is added at the time the dry batches are dumped. Another plant carries weighed amounts of sand, gravel and cement in a bucket conveyor, discharging them directly into the mixer. The purpose of this arrangement is to have head room because the equipment is installed in an existing building.

If bulk cement is used special handling equipment is required. Mixing water is piped from the city supply to a measuring device where the quantity may be accurately controlled. Electric power has been found extremely satisfactory and quite economical for running the mixer and all other possible equipment. Cranes which travel under their own power are usually operated by stream.

Layout of Plant

A structural framework, preferably enclosed to protect the operators and equipment, supports the plant machinery at different elevations. The ground level is devoted to a driveway running either under or alongside the mixer. On the first floor above grade are the mixer and motor. Above this is the charging or operating floor where the plant operator controls the proportioning of the materials and operates the entire plant. Over this are the storage bins. The total heights of the plant varies, ranging between 40 and 60 ft.

Paved driveways speed operations at the plant and are almost a necessity. Heavy trucks soon cut through cinders or other similar surfacing material.

Provisions for Cold Weather

Winter building has become so prevalent in the last few years that the central mixing plant should figure on a fair volume of business during the cold months. Owners of central plants have rapidly come to realize the value of delivering high quality concrete to the buyer, and that in cold weather the quality is seriously affected if heating precautions are not taken. Temperature affects the rate at which concrete hardens, the lower temperatures reducing the rate until it practically stops at the freezing point. Alternate freezing and thawing will completely destroy concrete, while a single freezing may impair the strength and durability. Because of these facts special precautions are required for cold weather work and should be employed when it is expected that the temperature will fall as low as 50 deg. F. By supplying live steam to the aggregates through a perforated grillage of pipes lining the storage bins, and using hot mixing water, warm concrete can be produced and delivered to any job serviced. In transit open trucks should be covered with a tarpaulin to protect the concrete from the weather and to help conserve the heat. Even during the most severe weather only a small amount of heat is lost by radiation from the truck.

Common or rock salt or other admixtures should not be added to concrete to prevent freezing. When chemicals are used in quantities sufficient to lower the freezing point of water to any extent, they reduce the strength materially.

Bulk Cement Provides Some Economies

The question of the use of bulk cement is one which often arises at the time of construction of the plant. A number of plants have found it more economical than sacked cement. If protected from strong drafts there is a surprisingly small amount of dust created in handling bulk cement. The savings may be summarized as follows: (1) No labor required for cleaning, handling and shipping empty cement sacks, (2) No lost or damaged sacks, (3) Less labor and quicker unloading of cars, sometimes eliminating demurrage, (4) Less money required to pay for a carload if cement, (5) No bookkeeping for sacks, (6) No fire insurance to pay on stored sacks, and (7) No storage space to provide for "empties."

One of the common methods of handling bulk cement is by use of an air conveying system, partly pneumatic and partly mechanical in action. It is essentially a tube containing a small screw conveyor fed at the front end by a hopper into which cement from the car is emptied, and equipped at the lower end with an aerated ring through which compressed air enters. Here is attached the conveying pipe, two to six inches in diameter, depending upon the required capacity. The screw, driven by a small motor, is directly connected to the shaft while the air is controlled by a separate compressor and valves. It is claimed by the manufacturers that the cement is "fluffed up" by the air, held in suspension, and forced through the pipe to the discharge end. At any rate, the volume of the cement is increased and made lighter by the addition of dry air. In this condition it assumes the properties of a fluid and is pushed, not blown, through the conveying pipe.

Weight measurement is the only satisfactory method if proportioning loose cement because the volume may change as much as 50% to 100% due to varying amounts of air being included in the mass. Ninety-four pounds is accepted as a standard for one cubic foot of cement. At the mill, cement is sacked on this basis.

Truck Bodies

Hauling ready mixed concrete is the biggest problem of the plant owner. This is well illustrated by the fact that, out of approximately 100 central mixing plants now operating, no standard type of truck body is in general use. The smaller plants employ the ordinary flat bottom dump trucks equipped with a vertical endgate or a hopper shaped end to help in dumping. The larger plants, for the most part, operate special trucks of which there are several on the market. Their function in hauling ready mixed concrete is to eliminate any segregation of materials that is apt to occur, to maintain a workable and plastic consistency without necessitating the addition of more mixing water at the job; and, to facilitate dumping, making picking and shoveling unnecessary at the time of discharge.

Trucks used for hauling concrete may be classified into three groups:

(1) *Flat Bottom Type.* With this type it is difficult to handle concrete having a slump greater than 3 to 4 in. for over a mile or two without causing segregation and compacting.

(2) *Special Body Type.* In this group are several designs, all of them planned either partially to eliminate segregation and compacting or to re-mix the concrete during discharge. Here, too, for successful service the concrete must be of a fairly dry consistency, and thoroughly mixed at the plant.

(3) *Agitator Type.* There are several types of trucks on the market designed to provide constant agitation in transit. Most of them are capable of handling concrete of any consistency although in some a certain amount of difficulty is encountered in dumping the dried mixes.

Paving concrete, designed with a slump not to exceed two inches, can be delivered satisfactorily in almost any truck. When concrete of the consistency ordinarily used in reinforced work, with a slump of about six inches, it hauled any appreciable distance it is necessary to use some sort of agitation to prevent the separation of materials. When the agitator type of truck is employed the hauling distance is practically unlimited.

The length of haul, however, becomes an economic factor, for the cost of delivering ready mixed concrete increases with the distance the material has to be transported. Experience will determine the limiting distances, and adjustments in the

price of the concrete may be made accordingly.

Tests on Hauled Concrete

Specifications frequently include a limit between mixing and time of placing concrete. Ordinarily this is 30 to 45 minutes. On rare occasions it is placed at one hour. This limitation is intended to assure a good quality of concrete in the work. Therefore, instead of setting a definite time between mixing and placing of ready mixed concrete, the stress should be laid in the quality. Specifications should state that all concrete should be thoroughly mixed concrete, the stress should be laid a plastic and workable condition without segregation. A time limit on the placing of concrete mixed at the site is not often a restriction, but with central mixing plants it may prove a serious hardship, especially in cities where the loaded trucks must pass through heavy traffic sections. The results of tests as indicated in *Public Roads* for December, 1921, and September, 1928, as well as other references indicate that the quality of concrete is not impaired by hauls up to 25 miles in distance or three hours in duration, provided that the material is delivered in a workable condition and will not need additional water to facilitate its handling.

Truck bodies should be washed, after the delivery of each load. When the inside of the truck is clean and smooth, concrete will dump easier than if little or no attention is paid to keeping the body in this condition. An ordinary garden hose and city water pressure are usually sufficient for the purpose. Oftentimes in washing truck bodies, cement and fine material are carried into the drains where they harden and clog the sewers. To avoid this, it is desirable to run the wash water through a sand filter. The installation of a box filled with sand 2 or 3 ft. deep through which the water from the wash rack can pass before entering the city sewerage system will prevent trouble from this source. It is a comparatively easy matter to keep fresh sand in the filter, while on the other hand it is troublesome and expensive to clean the sewers after cement has hardened in them.

Quality of Concrete

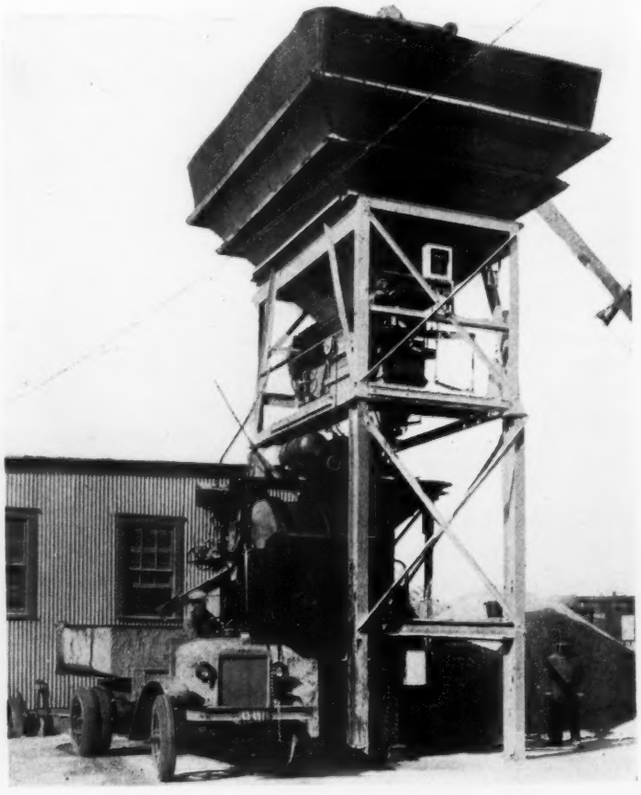
The central mixing plant can be better equipped to produce quality concrete than can any other type of concreting plant. All the facilities necessary to handle economically every operation can be provided without feeling that the cost to one particular job is excessive. It should be the aim of the central mixing plant owner to advertise his plant as producing a quality concrete, and as being able to service any size job with a dependable product. The water-cement ratio, as a basis for making concrete of predetermined strength and quality, has been used on many important jobs during the last few years. Its use is continually increasing and more architects, engineers and contractors are requiring it for their work.

The central mixing plant operator should thoroughly understand the principles of making concrete under the water-cement ratio law. This will give him a practical means of making concrete of predetermined quality. It will also give him a foundation on which to discuss with builders the advantages of quality control. In addition, he will have the opportunity of realizing definite savings in the amounts of materials comprising the mix.

The water-cement ratio law is stated as follows: "For given materials and conditions of manipulation, the strength of concrete is determined solely by the ratio of the volume of mixing water to the volume of cement so long as the mixture is plastic and workable."

The aggregate proportions are controlled by the desired workability. The amount of water required is stated in the specifications, and must not be changed. The plant operator will be at liberty, within reasonable limits, to adjust the proportion of fine to coarse aggregate, or to increase or reduce the total quantity of the aggregates, for with a con-

The plant of the Ready-Mixed Concrete Co. of New York City is a good example of the gravity type of plant



A small central mixing plant. The outfit of the Land Construction Co. of St. Joseph, Mo.

stant ratio of water to cement the quality is assured. In general, the central mixing plant operator will find it to his advantage to use the largest amount of aggregate consistent with proper workability.

Wider choice of aggregates is made possible by the use of a water-cement ratio specification. By proper adjustments of the mixture, aggregates of widely varying characteristics may be employed, under competent direction, to secure the desired strength and quality of concrete. The mixing plant operator is given opportunity to use his experience and knowledge of concrete proportioning so he can design economical mixtures of excellent and uniform quality.

Cooperation and Service

The success of a ready mixed concrete plant is governed largely by its ability to cooperate fully with contractors. It is the problem of the plant owner: first, to have a sufficient number of trucks so there will be no serious delays at the plant due to the trucks all being out on the job; and, second, to furnish concrete to the contractor at the time he wants it, causing him no inconvenience on account of delays in deliveries. It is better to turn down certain contracts and keep the good will of those who are buying ready mixed concrete than to try to service too many jobs in a single day. The establishment of good will between the central mixing plant and the contractor who is using the product is an important feature toward building up business and securing future orders.

Prices

Many operators find it advantageous to establish a definite schedule of prices for different classes of concrete. An established price, with small discounts for large quantities and prompt payment of invoices would seem to be the most satisfactory arrangement. A suggested schedule cannot be given because of the varying local markets. Hauling costs can be computed on the basis of established zones which each plant must work out for itself.

Central mixing plant of J. P. Callaghan, at Harrison, N. J.

Capital Required

Capital required to start a central mixing plant depends on the type and size of plant and the trucking equipment. Small plants have been built for as little as $20,000, while others have started business on $40,000 to $50,000. One equipment company estimates that $100,000 is the necessary capital required to finance construction of a medium-sized plant. A large plant may represent an investment of as much as $450,000 or $500,000. It might be fair to state that transportation equipment for the medium and large-sized plants represents from 50% to 70% of the total cost.

Due to the wide variety of trucks now used to haul concrete, prices vary from approximately $1000 for the simplest type of small capacity to $8000 or $9000 for the heavier types of special design and greater capacity.

Operating Personnel

The number of men required to operate a central mixing plant differs according to the design of the plant. Usually there are a plant superintendent, a mixer man, a plant office man, a helper to load trucks, two or three men for handling cement, one or two laborers and an operator for the derrick or hoisting equipment. Besides, there are truck drivers, and if the plant owns a number of trucks, one or two garage mechanics. Sometimes a night watchman is employed.

The average radius of haul is another varying factor in connection with the operation of a central mixing plant. Some owners in the smaller cities find that three or four miles is the limit for deliveries. Others deliver concrete on an average of five to eight miles. Still others have transported concrete as far as 20 miles. Transportation costs then must be computed for each plant before an economical maximum haul can be established.

Many companies have special sales organizations to secure orders, while others depend upon friendly acquaintances with builders. One plant doing a fair business added a special salesman, and in less than six weeks increased the average daily output from 200 to nearly 300 cu. yd. With a business as new as that of the central mixing plant, sales efforts should be well worth while both for producing immediate results

Ready-mixed concrete on the job. The warehouse was entirely constructed from centrally-mixed concrete. Note the new type of elevating truck

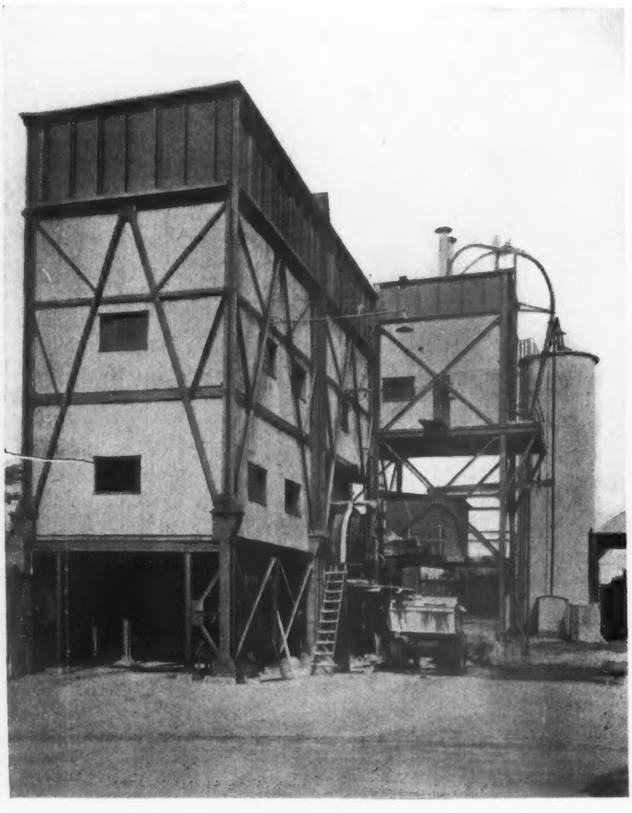
and for advertising features in the use of ready mixed concrete which will pave the way for future orders.

Truck Mixers

Because of the similarity to central mixing plants, mention should be made of central proportioning plants operating truck mixers. Some ready mixed concrete plants operate truck mixers in connection with their regular business. In general, approval has been placed on the ordinary stationary mixer. Questions have arisen as to whether or not truck mixers efficiently mix the concrete under all conditions of operation. As the driver must operate the truck as well as mix the concrete, the possibilities of accurate control are not as good as at a central plant.

The cost of truck mixers per yard of capacity is greater than trucks used in the ready mixed concrete business. However, with truck mixed concrete the stationary mixer and its maintenance are eliminated.

In conclusion, the points in favor of using ready mixed concrete are: (1) The responsibility for proportioning and mixing all concrete is placed in the hands of one man. This usually results in greater uniformity than is obtained in the field. (2) The permanency of the central plant allows the use of equipment to accurately measure quantities of materials that go into each batch, thus controlling the quality of concrete. (3) Mechanical equipment reduces labor costs to a greater extent than is possible under job methods. (4) The contractor is relieved of the necessity of setting up and maintaining a concreting plant. (5) Storage facilities for aggregates and cement, often difficult to provide in congested districts, are not required. (6) The hauling away of concreting equipment and excess materials after the completion of the job is eliminated.



Central mixing plant operated by the Van Sciver Corp., Philadelphia, Penn.

Comment of the Ready Mixed Concrete Business

In commenting on this paper, A. W. Dann, of the Keystone Sand and Supply Co., of Pittsburgh, described the situation in his city, where four gravel producers found it necessary to get together and form a ready-mixed concrete company, for which each was to furnish one-fourth of the aggregate. This company now operates two central mixing plants in Pittsburgh. Mr. Dann spoke of the necessity for the elimination of man power at the ready-mixed concrete plants to assure successful operation. In regard to some of the operating problems he suggested the heating of aggregates in cold weather by the use of pipes of live steam, and also the addition of a hot chamber around the bins. He also urged that the plant be kept tidy for the sake of smooth operation and safety.

Mr. Dann said that the race was on between the central mixing plant and the truck mixer which mixes as it delivers. The time required for delivery is not detrimental to the mix, he declared, if the material can be kept from segregation during the delivery time. More study of this problem of segregation in transit was necessary, Mr. Dann concluded.

John Prince of the Stewart Sand Co., of Kansas City, called attention to the fact that many aggregate producers went into the ready-mixed concrete business because they found it advisable, and even necessary, to control the aggregate to the very point of its use by the consumer, so that they could give the consumer assurance of the fullest value from the aggregate. This, he said, was the direct reason of the Pittsburgh combination described by Mr. Dann.

Alexander Foster, Jr., Charles Warner Co., Philadelpia, spoke on some of the requirements for a good central mixing plant, stating that one of the first necessities was a site conveniently located for getting material, and one where the overhead would not be great. Such a site could well be the corner of the company's material yard where the cranes or other loading equipment of the company could be used part of the time for the concrete plant at a considerable saving of overhead. Considerable discussion was given to the size of the mixer for a central plant. Mr. Foster said the tendency was toward a three-yard mixer, but that it was his opinion that the smaller mixer would be better in many cases, since the large size mixer takes longer to load, mix and unload.

Two more comments on the field in general were added by Mr. Foster. He said that as a handy rule for selling the ready-mixed product, the operator should figure that the return should be just twice as much as would be the sale price of the same amount of materials in a lose condition. And secondly, the operator should remember that he can not afford to sell to everyone, but must be sure that the customer to whom he is selling will use the batch rightly. Considerable harm can be done to the new industry if the concrete is poorly used after delivery.

Stephen Stepanian, of the Arrow Sand and Gravel Co., Columbus, Ohio, called attention to the different phases of merchandising the ready-mixed product. The engineers and architects demand a certain strength from the concrete, he said, while at the same time the contractor wants concrete when he wants it—and wants it workable.

Speaking as a manufacturer, A. A. Levison of the Blaw-Knox Co. called attention to the fact that the ready-mixed concrete plant was not actually new, as it had been used eight or ten years ago on construction jobs by contractors, though little material was produced for general sale. These plants were abandoned, Mr. Levison stated, because poor equipment generally furnished poor concrete. He said the reason that the industry was starting up again was because producers were realizing that they could manufacture satisfactory concrete with good equipment and ordinary care.

J. E. Burke of the Ready-Mixed Concrete Co. of Pittsburgh stated that to get real strength concrete the operator must have absolute control of his aggregates and of his water-cement ratio. To do this he has tried to eliminate the human element as far as possible. One of the interesting features of the company's program is the education of contractors and engineers to the understanding that the company can furnish a "strength concrete"—that is, a concrete of pre-determined guaranteed strength—through the careful grading of the aggregates.

Wisconsin Products Association Holds Unusually Interesting Meeting

Discussion of Papers Stimulates Members to Enthusiastic Support of Entire Program—Sessions at 1929 Meeting Voted Best Ever

By D. R. ("Spec") Collins

EVERYONE who has ever attended a Wisconsin Concrete Products Association convention knows Gladys Burnquist, secretary to the secretary of the association, and without a doubt as gracious a registration desk hostess as it would be possible to find. For six years she had presided at the registration desk of the Wisconsin association conventions. Gladys wrote the introduction to this story of the seventh annual convention, held January 11 and 12 at the Hotel Plankinton at Milwaukee, in a remark she made the second morning of the convention. "This is the lonesomest convention I've ever been at" she complained. "Other years there has always been a group in the lounge outside the convention room during all of the sessions. This year the lounge has been deserted. Everyone has been in the meeting room and they've stayed there until the very last minute of the session. You must be giving them something mighty interesting this year."

And it *must* have been interesting. Not only was there a record breaking attendance at every session but the interest in every paper presented and the amount of discussion that took place showed that those in attendance were absorbing everything that was said and storing it up, as knowledge for future use. It was a program that had been prepared months in advance. Every speaker had his paper carefully prepared and the members of the convention committee seemed equally familiar with them and in position to start an interesting discussion as soon as the speaker had finished with the formal presentation of his subject.

Les Grube of the Sheboygan Brick Company, president of the association, in opening the sessions stated that, "wherever concrete products manufacturers meet today the favorite topic of conversation seems to be the change that has come over the industry in the past few years. We hear talk of price cutting and cost cutting, of mass production and multiple shifts, or mergers and consolidations, of better merchandising methods and better production methods. All of these are important, yet one cannot be emphasized at the expense of the others. The industry has grown and if we fail, as individual manufacturers, to grow with it we are bound to be crowded out by outside competition." Mr. Grube then amplified on this statement. "Merchandising, cost cutting and mass production are but a part of the whole. If we manufacture the best products in our market, but have not built up proper facilities for selling them we will sooner or later have to go out of business. Or if, on the other hand, we have a good sales organization, but the factory cannot make a product good enough or cheaply enough to meet competition, we are as bad off. It is the purpose of this program to touch on these things in a manner that will cause those in attendance to think of them more seriously and go back to their factories with enough definite information to balance up both their sales and manufacturing organizations."

District Representatives Talk

Following this talk a new feature was injected into the opening session, that of reports by district representatives of the association. These men reported on business conditions in their particular localities and offered suggestions for activities that the association might carry on during the coming year. Committees were then appointed and the session adjourned until after lunch.

Bill Allan, Bob Smythe and Ted Merriam, all of the Cement Products Bureau of the Portland Cement Association, Chicago, had charge of the session the first afternoon of the convention. "Putting Promotion in Motion" was the subject that had been assigned to them. And what motion they put the meeting in! The meeting was to have adjourned at five. It was after six before it closed, so interesting was the information that these "Three Wise Men" from Chicago presented and so eloquent was the discussion and narration of experience following their stated talks.

Bill Allan, in introducing the other speakers and starting the motion, briefly reviewed the concrete products business in the United States during the past year. "In 1927," he stated, "the production of concrete building units in this country was estimated from statistics gathered by the Portland Cement Association to be 355 million units. During 1927 this total jumped to a total of 387 million units, an increase of 32 million units. During this same period the sale of face brick fell off 6% and the sale of common brick fell off 9%. The consumption of concrete block per capita in the United States jumped from 2.9 in 1927 to 3.2 in 1928. We also find that the aggressive plants are constantly adding to their total productions and we are surely getting more plants into the million production class. In 1927 there were twenty-eight plants in the United States that produced over a million units. In 1928 thirty-nine plants could be rated in the millionaire class as far as production was concerned. We in the Portland Cement Association have made a careful study of these plants which have been increasing their production so rapidly and find that without exception the reason for this increase has been aggressive merchandising on the part of the manufacturer. That tells us that we must spend more time on this merchandising end of our business. However we cannot at this time lose sight of the fact that if we are going to create volume consumption of our product we must have mass production to supply that demand."

Bob Smythe, following Mr. Allan, brought out the point that there were at the present time over 300 salesmen in the United States devoting their entire time to the sale of concrete products. This, he said, was in sharp contrast to the situation a few years back when scarcely a products manufacturer had a salesman in the road selling his products. "We must have three things," Mr. Smythe stated, "if we are to meet the competition of other masonry materials: A quality product, economically manufactured, and aggressively sold. One is interdependent on the other two and the combination of all three is necessary for success."

The entire talk was illustrated by views of notable concrete masonry jobs completed during 1928 and of complete advertising campaigns, by examples of good publicity obtained by products manufacturers, and by graphs and charts illustrating various points having to do with

production and sales.

Ted Merriam, who assumed charge of the program following Smythe, had his hands full. It was his duty to bring about discussion of the points outlined by Bill Allan and Bob Smythe. How well he succeeded can be attested to in the fact that there were two solid hours of this discussion. It opened up in a general way on merchandising, swung over to advertising and then lit with a crash on production methods. It had been brought out by the speakers that the average plant efficiency is only 7% and that to increase this efficiency multiple shifts were necessary. Some argued for three 8 hour shifts, others were for two 10 hour shifts and there were many who doubted the advisability of more than a single shift of eight or ten hours. They're still arguing about it, but Bill Allan predicted and is willing to go on record that five years from now many of those present would be operating more than one shift in their plants.

Committee meetings and a meeting of the Cast Stone Manufacturers of Wisconsin were the only items on the program for the evening of the first day. The Cast Stone men have been maintaining an advertising campaign in the state during the past year and with the idea of expanding this and doing other worth while educational and promotional work their dues were raised considerably for 1929.

Eight 10 minute papers were listed on the program for the second day, together with election of officers and a skit facetiously titled "Stripping Down for Action." The subjects for these papers had been decided by the program committee last summer, and had been passed on to the men who were to prepare them with instructions to "take your time, but make it good." Every one of these papers reflected the fact that much thought had been put on them and in practically every instance the time allotted for discussion was overrun.

The Small Plant

With much talk of mergers and consolidation and with many wondering what was to become of the small factory, the paper "What of the Small Factory?" by W. G. Rathke of Eau Claire was especially timely. Mr. Rathke feels that the small plant will always have a place in the community and he reasons as follows:

"With changes taking place so swiftly and industries becoming bigger and bigger the small manufacturer must often wonder when he will be either gobbled up or flattened out by the steam roller of progress because of inability to meet the prices of his competitors. Sentiment cannot enter into it. The mere fact that a small business has been established for many years in a community will not offset the factor that a new competitor, only in business for a year, is able to sell his product at a lower price.

"In our line of business we have often heard the question asked as to whether or not the small concrete products manufacturer—in competition with plants in the so-called millionaire class—can hope to survive.

"There is no good reason why a products plant with an annual production of 100,000 units or slightly in excess of that amount cannot make a fair return on the invested capital. In order to do this, however, there must be correct plant design, efficient machinery, conservative and good management and above all a quality product must be made which will pass all tests that might be required of it. It would be out of the question to attempt to compete with the large plants with an inferior article.

"With correct plant design it is a fact that two men can easily do all of the operations necessary in the making and yarding of over 100,000 units, in an operating season of ten months, while under old fashioned and obsolete methods four and five men would be required daily.

"Simple and efficient machinery must be provided. It would certainly be a mistake for a manufacturer to purchase a machine with a capacity of a million units and its resultant large investment when living adjacent to a market which can only absorb 10,000 units.

"A good machine with a rated capacity of 900, to 1000 blocks per day, which is simple to operate, is all that would be required in such a case and it is reasonable in price. It is easier to add another machine later, should business warrant it, out of the profits resulting from good management in keeping the original investment to its proper level.

"Personal contact with the customer and giving service will tend to create a good will which will constantly reflect in increased business. We should interest ourselves in our customers. The fact that one purchase of units for a basement or small building is all we may ever receive from a customer will not excuse slipshod methods of delivering these units to him. We should call on the job and assure ourselves that deliveries are being properly made and that units are being placed so that walls can be laid up with a minimum of labor. If carelessness has caused any spoilage it should be adjusted at once. A list of satisfied customers will go far to offset advantages which a large plant may seem to have, but who are so big that they cannot get in personal contact with all of their trade.

"Accurate cost records must also be kept by the small manufacturer. It is more necessary for the small operator to scrutinize each expense carefully so as to eliminate all unnecessary items. Records should be kept so that comparison of expense can be made with other years so as to note savings accruing to careful management.

"If proper attention is given to the costs of operation of a small factory in all departments there can be no reason why the concrete products plant with a limited production cannot actively compete with the large plants and at the same time enjoy a reasonable return on the invested capital."

Arthur W. Grube of the Sheboygan Brick Co. in developing a paper entitled "Some New Ideas On An Old Subject" showed how the development of several shapes and sizes and special units had been of great assistance in overcoming competition from clay brick. The use of a specially made header brick of odd size not only gave a better looking wall but was a good talking point in landing other jobs. This paper brought out the use of special units in the block business and developed quite a discussion as to whether or not the special unit was an asset to the manufacturer or a liability.

Roofing Tile

William H. Devos, who has been in the concrete products business in Milwaukee for the past fifteen years has just started the manufacture of concrete roofing tile. He now not only furnishes the blocks for the basements but the roof for the job as well. His subject was "From the Bottom to the Top." Mr. Devos' paper dealt largely with manufacturing methods. It is doubtful if anyone in Milwaukee has done more experimental work with concrete products than Mr. Devos, making him a particularly fitted to present in a simple and interesting manner the results of the experiments he is conducting in the perfection of the new unit he is now manufacturing. The question of color, an old bugaboo in roofing tile manufacture, was discussed at length.

Arthur Sorenson, of Racine, took up in an interesting manner the subject of "A Square Block for a Round Hole," this being the development of the business of manufacturing and selling concrete manhole and catch basin blocks. Mr. Sorenson not only told of his own personal experiences in developing this business in his home town, but sprung a surprise on the convention by bringing with him one of the contractors to whom he had sold many of these units to answer any questions that might be asked as to the practicability of the units.

The afternoon session of the second day was opened by A. E. Broker of Plymouth, one of Wisconsin's pioneer manufacturers of concrete trimstone. His subject, "Trimming Our Sales," put the trimstone business in a rather different light

than most of us think. It seems, according to Mr. Broker that the trimstone manufacturer as a rather difficult row to hoe and that this business is one requiring not only engineering skill but most skillful salesmanship. An inferior quality of stone turned out by some manufacturers in the past has made it difficult for the manufacturer of a quality product to get the price he deserves. Another unpleasant factor that has of late entered into this business is the fact that manufacturers of trimstone are in many cases now being asked to assume second mortgages in lieu of cash for their material.

C. O. Gochnauer of the Gochnauer Concrete Products Co. of Appleton in a paper entitled "Putting Over Something New" told how his company had decided to take up the manufacture of haydite blocks and how they put this product on the market. Before the product was taken on an investigation was conducted as to the reliability of the company making the material, the sales possibility, the cost and a thorough study made of technical data available on the material. How the newly acquired material was sold to the Appleton building public by means of an advertising campaign was then taken up in detail, illustrated with the advertisements which were used. This campaign is probably as well written and thorough as anything that has been attempted by a manufacturer of concrete building material. So successful was Mr. Gochnauer's company in "putting over" his new material that his plant has run at capacity all year.

Fred Simmonds of the Cincrete Corporation, Milwaukee, who is regarded in this part of the country as a production wizard, next presented a paper on "Getting the Most with What You Have." This paper was centered around production methods used by Mr. Simmonds, and so lengthy was the discussion following it that the rest of the afternoon's program was threatened. How high productions can be obtained with small machines seemed to interest everyone present and much interesting information along this line was brought out.

L. E. Schwalbe of the Economy Concrete Products Co., Wauwatosa, who has recently started the manufacture of slag blocks outlined at length the experimental work that his company is doing to perfect this newcomer in the concrete products field. His talk, "Increasing the Family," brought out many new points about this material and its practical application in the manufacture of concrete block.

A short business session followed Mr. Schwalbe's talk at which in a brief manner plants for the coming year were outlined. Officers were then elected to carry on the work of the association for 1929. The writer, D. R. Collins of Milwaukee was elected president, R. J. Westerveld of Wausau was elected vice-president and Jack Franklin of Milwaukee was re-elected secretary-treasurer of the organization.

"Stripping Down for Action," a feature which had been shrouded in secrecy, was the last number on this best of all Wisconsin programs. As the curtain was drawn aside the audience discovered a mason wearing a huge coat, galoshes, muffler, gigantic mittens, cap and dark glasses at work trying to lay up a concrete block wall. Soon the spirit of business, "monkey business as well as good business," he announced himself, appeared. The title was soon apparent, for as the "Spirit of Business" stripped off the wearing apparel of the mason, piece by piece, his efficiency became greater until the last row of blocks was laid with a dash that would cause envy among masons who thought they were world beaters at such a job. Julius Sorenson of Racine acted as mason. Each impeding piece of clothing, as it was brought out by the Spirit of Business (Harry Shields of the Lehigh Portland Cement Co.) was some obstacle that the average concrete products manufacturer was burdening himself with in the conduct of his business. Illustrated with charts and pictures Mr. Shields then traced the many changes taking place in the business life of the nation and showed how the concrete products manufacturer must recognize these changes not only in other lines but in his own and fortify himself against them if his business was to grow and prosper and combat influences that are being brought to bear by competitive materials to secure a part of the business now going to concrete products. The feature came as a complete surprise and held those in attendance until the last word had been spoken.

The banquet and entertainment, which has always been a feature of Wisconsin Concrete Products Association meetings, was held the second evening of the convention. Entertainment, which was furnished by manufacturers of concrete products plant equipment, went on at a rapid rate for three full hours.

One thing that has become noticeable about Wisconsin conventions the past few years is the number of concrete products men from adjoining states in attendance. It seems that once a products manufacturer attends one of these meetings he makes it a practice never to miss one. The total attendance this year was in the neighborhood of 200, and it is gratifying to say that by far the majority of these were men actually engaged in the manufacture and sales of concrete products. One large manufacturer from Iowa was in attendance and with him was his newly appointed sales manager. "I figured," he said, "that I couldn't find a better way to get this man started right than to bring him to a Wisconsin convention." Well, it was enough to keep anyone headed in the right direction for some time to come.

Manufacturers to Exhibit at Cleveland Convention

THE FOLLOWING list of associate members of the National Crushed Stone Association will have exhibits at the National Crushed Stone convention to be held at Cleveland, Ohio, January 21-25:

Air Reduction Sales Co.
Allis-Chalmers Manufacturing Co.
American Manganese Steel Co.
American Tar Products Co.
Armstrong Manufacturing Co.
Atlas Powder Co.
Earle C. Bacon.
Blaw-Knox Co.
Bucyrus-Erie Co.
Burrell Engineering and Construction Co.
Cement, Mill & Quarry.
Chicago Pneumatic Tool Co.
Cross Engineering Co.
Dorr Co.
E. I. duPont de Nemours and Co.
Easton Car and Construction Co.
Fate-Root-Heath Co.
General Electric Co.
Good Roads Machinery Co.
Goroco Mechanical Spreader Co.
Gruendler Patent Crusher and Pulverizer Co.
Harnischfeger Sales Corp.
The Hayward Co.
Hendrick Manufacturing Co.
Hercules Powder Co.
Ingersoll-Rand Co.
Kensington Steel Co.
Keystone Lubricating Co.
Koppel Industrial Car and Equipment Co.
Link-Belt Co.
The Loomis Machine Co.
Manganese Steel Forge Co.
Marion Steam Shovel Co.
National Malleable and Steel Castings Co.
Niagara Concrete Mixer Co.
Nordberg Manufacturing Co.
The Osgood Co.
Paperboard Industries Association.
Pit and Quarry.
Pittsburgh Coal Washer Co.
Productive Equipment Corp.
Robins Conveying Belt Co.
Rock Products.
Sanderson-Cyclone Drill Co.
Sauerman Bros., Inc.
Simplicity Engineering Co.
The Stearns Conveyor Co.
Stephens-Adamson Manufacturing Co.
The Thew Shovel Co.
Traylor Engineering and Manufacturing Co.
Troco Lubricating Co.
W. S. Tyler Co.
Union Explosives Corp.
Vulcan Iron Works.
Williams Patent Crusher and Pulverizer Co.

To Operate Talc Deposit

A DEPOSIT of talc and soapstone near Bagby, Mariposa county, Calif., recently acquired from Herbert Show of Stockton by G. J. Bentley and James Duncan of Oakdale, is to be opened up at once for active quarrying operations. According to plans, work will start immediately, with Earl Klein of Stent in charge of operations.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Mo.	.50–.75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Springs, W. Va.	.40	1.35	1.35	1.30	1.25	.....
Munns, N. Y.	.75	1.50	1.50	1.25	1.15	.....
Prospect, N. Y.	.85	1.15	1.15	1.15	1.15	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.75	1.35–1.45	1.15	.95	.90	1.00
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
West Chester, Penn.	5.00g	.....	.....	.....	.....	4.00k
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.....	.....	.50	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Cypress, Ill.	.90–1.15	.90–1.15	1.00–1.15	1.00–1.20	1.00–1.15	1.00
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.85	1.10	.....	1.10	1.10	.....
Stolle and Falling Springs, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Greencastle, Ind.	1.25	1.05	1.05	1.05	.95	.95
Lannon, Wis.	.90	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90–1.00	1.00–1.10	.90–1.00	.85–.90	.85–.90
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	.....	1.20	1.05	1.00	.....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	.45	.95	.95	.80	.80	.80
Valmeyer, Ill. (fluxing limestone)	.90–1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.....	.90	.90	.90	.90	.90
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h
SOUTHERN:						
Cartersville, Ga.	1.20	1.65	1.65	1.45	1.15	1.15
Chico, Texas	1.30	1.25	1.20	1.10	1.00	.95
Cutler, Fla.	.60r	.....	.....	1.75r	1.10r	.....
El Paso, Texas	.50–.75	1.00–1.25	1.00–1.25	1.00	1.00	1.00
Graystone, Ala.	Crusher run, screened, $1 per ton					
Olive Hill, Ky.	1.00	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50–.75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis, Mo.	1.00	1.25	1.25	.90–1.25	.90–1.25	.90–1.25
Sugar Creek, Mo.	.75	1.00	1.20	1.20	1.20	1.20

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.75	1.25	1.25	1.25
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.65	1.40–2.30	1.80–2.10	1.40–1.70	1.40–1.70	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	.....
Toronto, Canada (m)	.....	1.95	2.45	.....	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.—Granite	.50	.....	1.75	1.75	1.60	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	.....	2.35	.....	.....	.....
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	.....	.....	1.50 to 1.85	.....	.....	.....
Toccoa, Ga.	1.40	1.40	1.35	1.30	1.25	1.20

(a) Sand. (b) to ¼ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.50. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (m) Prices at quarry. Extra charge for freight to Toronto. (n) Crusher run for ballast, .85. (p) Carloads prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh 4.50

Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh 1.50

Blackwater, Mo.—100% thru 4 mesh 1.00

Branchton, Penn.—Analysis, 94.89% $CaCO_3$; 1.5% $MgCO_3$; 50% thru 100 mesh 3.50–5.00

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh 1.50

Cartersville, Ga.—50% thru 50 mesh 1.50
Pulverized, per ton 2.00

Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk 2.50

Cypress, Ill.—Analysis, 95% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh 1.00

Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk 3.50
Paper bags 4.75
100-lb. cloth bags 5.25

(All prices less .25 cash 15 days)

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton 6.00
90% thru 20 mesh, bulk, per ton 1.50

Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked 5.00

Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags 3.95
Bulk 2.70

Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk 2.75

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh 3.50

Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk 2.70

Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk 1.75
Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk 2.25

Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton 2.00

Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh; bulk, 2.75; paper bags 4.25

Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk 1.35–1.60

Olive Hill, Ky.—50% thru 4 mesh 1.00

Piqua, Ohio—Total neutralizing power 101.12%; 99% thru 10, 60% thru 50; 45% thru 100 ..... 2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk 3.50
100% thru 4, 30% thru 100, bulk 1.50

Rocky Point, Va.—Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk 2.00

Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk 2.50

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%, $MgCO_3$; 90% thru 10 mesh 1.50
30% thru 100 mesh 1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 50% thru 4 mesh 1.00

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton 1.25
90% thru 4 mesh, per ton 1.10

Dubuque, Iowa—Analysis, 54% $CaCO_3$; 38% $MgCO_3$; crusher run rescreened .... .85

Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00

Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 50% thru 50 mesh 1.50

Kansas City, Mo.—50% thru 100 mesh 1.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼ in. to dust) 1.00

Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00

McCook, Ill.—90% thru 4 mesh ..... .90

Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh 1.50

Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags 5.00

Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.10–1.70

Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75

Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh 2.15

Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh 1.10–1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks 6.00

Hillsville, Penn., sacks, 4.50; bulk 3.00

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra) 3.50

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks 4.25

Piqua, Ohio, sacks, 4.50-5.00; bulk 3.00–3.50

Rocky Point, Va.—85% thru 200 mesh, bulk 2.25–3.50

Waukesha, Wis.—90% thru 100 mesh, bulk 4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J. *1.75–2.25
Estill Springs and Sewanee, Tenn. 1.50
Franklin, Penn. 2.00
Klondike, Mo. 2.00
Massillon, Ohio 3.00
Michigan City, Ind. ..... .30– .35
Ohlton, Ohio 2.50
Ottawa, Ill. 1.25
Red Wing, Minn. 1.50
Rockwood, Mich. 2.25–3.00
San Francisco, Calif. 4.00–5.00
Silica and Mendota, Va. 1.75–2.00
St. Louis, Mo. 2.00
Utica and Ottawa, Ill. 75–1.00
Zanesville, Ohio 2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio	.....	1.75
Dresden, Ohio	.....	1.25
Eau Claire, Wis.	4.30	.....
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.	.....	1.75
Massillon, Ohio	.....	2.00
Michigan City, Ind.	.....	.30
Montoursville, Penn.	.....	1.25
Ohlton, Ohio	1.75–2.00	1.75
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.	.....	1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.	.....	1.75

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.....	.55	1.10	1.25	1.40	.....
Attica and Franklinville, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00
Boston, Mass.†	1.40	1.40	2.25	.....	2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.60	.85	.....	.....	1.25	.....
Leeds Junction, Me.	.....	.50	1.75	.....	1.25	1.00
Machias Jct., N. Y.	1.00	1.00	1.00	.....	1.00	1.00
Milton, N. H.	.....	.50	.....	.....	.....	.90
Montoursville, Penn.	1.00	.80	.60	.50	.50	.40
Northern New Jersey	.....	.50– .60	.....	1.25	1.25	.....
Somerset, Penn.	.....	2.00	.....	.....	.....	.....
South Portland, Me.	.....	1.25	2.75	.....	.....	2.25
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*	.....	.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75	.....	1.75
Washington, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Attica, Ind.			All sizes .75–.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.	.....	.40s	.....	.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90n
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio	.....	.60	.60	.60	.60	.....
Des Moines, Iowa	.....	.30	.....	1.40	1.50	.....
Eau Claire, Chippewa Falls, Wis.	.55	.55	.70	1.00	1.00	.....
Elkhart Lake, Wis.	.70	.60	.70	.70	.70	.70
Ferrysburg, Mich.	.....	.50– .80	.60–1.00	.60–1.00	.....	.50–1.25
Grand Haven, Mich.	.....	.60– .80	.70– .90	.70– .90	.....	.70– .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio	.....	1.00	1.00	.....	1.00	.....
Hersey, Mich.	.....	.50	.....	.....	.....	.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60	.....	.75	.75	.75
Mankato, Minn.	.....	.45g	.....	.60–1.25h	.70–1.25	1.25c
Mason City, Iowa	.50	.50	.85	1.25	1.25	1.25
Mattoon, Ill.			.75–.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	1.25	1.25	2.40	2.40	2.40	2.25–2.40
St. Louis, Mo. (b)	1.15e	1.15f	1.45a	1.45	1.45	1.65
St. Louis, Mo.	.....	.....	†1.45t	†1.45u	†1.65v	†1.65
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.85	.75	.75	.75
Waukesha, Wis.	.....	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
SOUTHERN:						
Brewster, Fla.	.50	.50	.....	.....	.....	.....
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.	.....	.45– .50	.....	.....	.....	.....
Ft. Worth, Texas	1.00	1.00	1.25	1.10	1.00	1.00
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.00
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00	.....	1.30	1.10	.90
Roseland, La.	.30	.30	1.00	.95	.70	.70
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75	.....	.....	.....	.....
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Oregon City, Ore.			All grades range from 1.00 to 1.25 per cu. yd.			
Otay, Calif.	.....	.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.80	.60	.....	1.20	.....	1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.	.....	.....	.40	.....	.....	.....
Brookhaven, Miss.	.....	.....	.....	.....	.....	.60
Buffalo, N. Y.	1.10	.95	.....	.85	.....	.85
Burnside, Conn.	.....	.75*	.....	.....	.....	.....
Chicago, Ill.	1.25m	.....	.....	.35	.....	.....
Des Moines, Iowa	.....	.....	.....	.60	.....	.....
Dresden, Ohio	.....	.....	.....	.70	.65	.....
Eau Claire, Chippewa Falls, Wis.	.....	.....	.....	.....	.65	.....
Fort Worth, Texas	.....	.....	.....	.....	.....	.70r
Gainesville, Tex.	.....	.....	.....	.....	.55	.....
Grand Rapids, Mich.	.....	.....	.....	.50	.....	.....
Hamilton, Ohio	.....	.....	.....	.....	1.00	.....
Hersey, Mich.	.....	.....	.....	.50	.....	.....
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.35	.....	.....	.....	.....	.....
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.	.....	1.85–2.00	.....	1.50–1.75	.....	.....
Steilacoom, Wash.	.....	.25	.....	.....	.....	.....
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	1.50	1.25	1.10	1.10
York, Penn.	1.10	1.00	.....	.....	.....	.....

*Cubic yd. †Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¼-in., 1.65. (c) 2½-in. and less. ‖By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Washed and screened river sand. (h) ¾-in. to ¼-in. (j) Lake sand, 1.75, delivered. (k) 60-70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.75	2.75	.50–2.75	1.75–2.00	1.75–4.00	
Beach City, Ohio	1.75	1.75		1.75	2.00		
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00–1.25			
Eau Claire, Wis.						3.00–4.30	
Elco and Murphysboro, Ill.	Water-floated ground silica per ton in carloads—18.00–31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	1.75–2.25	1.50–1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00			
Massillon, Ohio	2.25	2.25		2.50	2.50		
Michigan City, Ind.				.30– .35			
Montoursville, Penn.				1.60			
New Lexington, Ohio	2.25	1.75					
Ohlton, Ohio	1.75	1.75		2.50	1.75	1.75	
Ottawa, Ill.	1.25	2.25	2.25	2.25	1.25	3.50	2.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.	Potters flint, 8.00–10.00g. Polishing sand, 1.75–2.00						
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Also 12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.00	1.00		1.00			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.45*	1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.90
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†		.50*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.						10.00	7.50	
Carey, Ohio	11.50	7.50	7.50		8.00		8.00	1.50
Cold Springs, Ohio		7 50	7.50					
Gibsonburg, Ohio	11.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[16]
Scioto, Ohio	11.50	7.00	7.00	8.00	8.25	.62½	6.00	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[8]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00		12.50			7.50	1.35
Keystone, Ala.	19.00	9.00	9.00	9.00			7.50	1.35
Knoxville, Tenn.	19.00	9.00	9.00	9.00			7.50	1.35
Ocala, Fla.	14.00	11.00	10.00	14.00				1.40[10]
WESTERN:								
Kirtland, N. M.							15.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.00–19.50	16.00–17.50	12.50–13.70	19.00	13.00[19]	.90[17]	13.00[19]	1.85[17]
Tehachapi, Calif.[18]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] to 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] Also 14.50. [22] To 9.00. [23] Per bbl., 2.15. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Ground talc (20-50 mesh), bags 7.00– 8.50
- Ground talc (150-200 mesh), bags 7.25–15.00
- Pencils and steel crayons, gross, 5-in., .80–1.75; 4-in. .50– 1.25

Chester, Vt.:
- Ground talc (150-200 mesh), paper bags 7.50–8.50a
- Same, including 50-lb. bags 8.50– 9.50

Chicago and Joliet, Ill.:
- Ground (150-200 mesh), bags 30.00

Cromleys Mt., Md.:
- Crude talc 63.00

Dalton, Ga.:
- Crude talc (for grinding) 4.00
- Ground talc (150-200 mesh), bags 9.00
- Pencils and steel worker's crayons, per gross 1.00– 2.00

Emeryville, N. Y.:
(Double air floated) including bags:
- 325 mesh 14.75
- 200 mesh 13.75

Hailesboro, N. Y.:
- Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh 15.50–20.00

Henry, Va.:
- Crude (mine run) 3.50– 4.50
- Ground talc (150-200 mesh), bags 7.50–14.50

Joliet, Ill.:
Ground talc (200 mesh) in bags:
- California white 30.00
- Southern white 20.00
- Illinois talc 10.00
- Crude talc 3.75

Keeler, Calif.:
- Ground (200-300 mesh), bags 20.00–30.00

Natural Bridge, N. Y.:
- Ground talc (300-325 mesh), bags 12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

- Columbia, Tenn.—B.P.L. 65-70% 3.50– 4.50
- Gordonsburg, Tenn.—B.P.L. 65-70% 4.25– 4.75
- Mt. Pleasant, Tenn.—B.P.L., 77% 6.50
- Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72% 5.00
- B.P.L. 75% 6.00
- Twomey, Tenn.—B.P.L. 65%, 2000 lb. 8.00– 9.00

Ground Rock
(2000 lb.)

- Centerville, Tenn.—B.P.L. 65% 8.00
- Gordonsburg, Tenn.—B.P.L. 68% 3.50
- B.P.L. 72% 4.50
- Mt. Pleasant, Tenn.—Lime phosphate: B.P.L., 73%, 98% thru 100 mesh, 90% thru 200 mesh, 80% thru 300 mesh 11.20
- B.P.L. 72% 5.00–5.50
- Twomey, Tenn.—B.P.L. 65% 8.00
- Wales, Tenn.—B.P.L. 65% 11.00

Florida Phosphate

(Raw Land Pebble)
(Per Ton)

- Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68% 3.25
- 70% min. B.P.L., Basis 70% 3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

- New York City, N. Y.—Per lb., Cut mica (1½x2) 1.60
- Cut mica (8x10) 26.00
- Pringle, S. D.—Mine run, per ton 125.00
- Punch mica, per lb. .06
- Scrap, per ton, carloads 20.00
- Rumney Depot, N. H.—Per ton, Mine run 300.00
- Clean shop scrap 25.00
- Mine scrap 22.50–24.00
- Roofing mica 37.50
- Punch mica, per lb. .12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, English cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar		4.50– 6.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.—Royal green	16.00–18.00a	
Harrisonburg, Va. — Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash		11.00–18.00
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white	10.00	10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50– 7.50
Phillipsburg, N. J.—Royal green granite		15.00–18.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Rose pink granite, bulk		12.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	
Warren, N. H.		¶7.90–‖8.95
Wauwatosa, Wis.		20.00–32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.		*10.00

†C.L.: L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. *Per 100 lb.

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh	19.00
Buckingham, Ore. — White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y. — Color, white; analysis, K_2O, 9.63%; Na_2O, 1.01%; SiO_2, 69.72%; Fe_2O_3, .00%; Al_2O_3, 18.6%; bulk (crude)	9.00
East Hartford, Conn. — Color, white, 40 mesh to 200 mesh	15.00–28.00
East Liverpool, Ohio — Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk	11.00–12.50
Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk	15.75–22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk (Bags 15c extra.)	18.00
Crude feldspar, bulk	12.00
Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Colo, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50– 8.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Tex.	20.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks: Feldspar	14.00
Gypsum	7.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	7.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags. (a) F.o.b. Middlebury, Vt.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Anaheim, Calif.	10.50–11.00
Barton, Wis.	10.50g
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50–13.50
Detroit, Mich.	j13.00–16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00–19.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50–15.00*
Pontiac, Mich.	15.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50–14.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	15.00†c
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc. 10 days. ‖Dealers' price. (a) Less 50c disc. per M. 10th of month. (d) 5% disc., 10th of month. (e) Delivered. (f) F.o.b. yard, 12.50. (g) Delivered Milwaukee, 13.00. (j) Also 14.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.		2.36	3.51¶
Baltimore, Md.		2.25–2.65	3.55¶
Birmingham, Ala.		2.00	3.44¶
Boston, Mass.	.68¼	2.23–2.73e	3.27¶
Buffalo, N. Y.	.62½	2.00–2.50	3.40¶
Butte, Mont.	.90¾	3.61	
Cedar Rapids, Iowa		2.24	
Charleston, S. C.		2.25–2.65d	3.58¶
Cheyenne, Wyo.	.64	2.56	
Chicago, Ill.		2.05–2.45	3.35¶
Cincinnati, Ohio		2.22–2.62	3.52¶
Cleveland, Ohio		2.24–2.64	3.54¶
Columbus, Ohio		2.22–2.62	3.52¶
Dallas, Texas		1.80	3.39¶
Davenport, Iowa		2.24	
Dayton, Ohio		2.24–2.64	3.54¶
Denver, Colo.	.63¾	2.55	
Des Moines, Iowa		2.14	
Detroit, Mich.		1.95–2.35	3.25¶
Duluth, Minn.		2.04	
Houston, Texas		1.90	3.63¶
Indianapolis, Ind.	.54¾	2.09–2.49	3.39¶
Jackson, Miss.		2.44	3.54¶
Jacksonville, Fla.		2.60b	3.79¶
Jersey City, N. J.		2.13–2.53	3.43¶
Kansas City, Mo.	.45½	1.82	3.22¶
Los Angeles, Calif.	.62½	2.50	
Louisville, Ky.	.55½	2.57	3.47¶
Memphis, Tenn.		2.04–2.44	3.34¶
Milwaukee, Wis.		2.20–2.60	3.50¶
Minneapolis, Minn.		2.12–2.22	
Montreal, Que.		1.60	
New Orleans, La.	.45½	1.82	3.61¶
New York, N. Y.	.60¾	1.93–2.43	3.33¶
Norfolk, Va.		1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.		2.22	
Philadelphia, Pa.		2.11–2.61	3.51¶
Phoenix, Ariz.		3.91*	
Pittsburgh, Penn.		2.04	3.34¶
Portland, Ore.‡		2.40–2.90a	
Reno, Nev.‡		3.41a	
Richmond, Va.		2.32–2.80	3.62¶
Salt Lake City, Utah	.70¼	2.81	
San Francisco, Calif.‡		2.71a	
Savannah, Ga.		2.80c	3.65¶
St. Louis, Mo.	.48¾	1.95–2.35	f3.25¶
St. Paul, Minn.		2.12–2.22	
Seattle, Wash.		2.50†	f3.50†
Tampa, Fla.		2.40	4.11¶
Toledo, Ohio		2.20–2.60	3.50¶
Topeka, Kans.	.50¼	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.		2.12–2.52	
Winston-Salem, N. C.		2.29–2.69	3.59¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

Albany, N. Y.	.43¾	1.75	
Bellingham, Wash.		2.10	
Buffington, Ind.		1.80	
Chattanooga, Tenn.		2.45*	
Concrete, Wash.		2.35	
Davenport, Calif.		2.05	
Hannibal, Mo.		1.90	
Hudson, N. Y.		1.75	
Leeds, Ala.		1.65	
Lime and Oswego, Ore.		2.50‡	
Mildred, Kan.		2.35	
Nazareth, Penn.		2.15	
Northampton, Penn.		1.75	
Richard City, Tenn.		2.05	
Steelton, Minn.		1.85	
Toledo, Ohio		2.20	
Universal, Penn.		1.80	

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 24c bbl. refund for paid freight bill. (c) 35c bbl. refund for paid freight bill. (d) 40c bbl. refund for paid freight bill. (e) 45c bbl. foreign refund. (f) "Velo" cement, including cost of paper bag. ¶ "Incor" Perfected prices per bbl. packed in paper sacks.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard. ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.70	4.00	4.00	4.00	4.00	4.50	.....	.....	.....	.....	.....	15.00	20.00
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Blue Rapids, Kan.	1.70	4.00	.....	.....	.....	.....	10.00	.....	.....	.....	.....	15.00	20.00
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00–11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	4.50–5.00	13.10–14.00	5.00	.....	7.25	.....	.....	.....	.....	25.00
Douglas, Ariz.	.....	.....	6.00	14.50	15.00	.....	18.00	.....	30.00	.....	.....	.....	.....
Fort Dodge, Iowa	1.70	4.00	6.00	9.00	9.00	9.50	.....	.....	.....	19.00	.....	15.00	20.00
Grand Rapids, Mich.	2.65	4.00	6.00	6.00	9.00	9.00	17.65	.....	22.75	19.00	12.00	15.00	18.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00	.....	15.00	20.00–25.00
Los Angeles, Calif.	4.90	7.50m	7.50m	8.40	9.00	.....	10.00	.....	36.00u	9.00	19.00	21.00	27.50
Medicine Lodge, Kan.	1.70	4.00	.....	.....	.....	.....	.....	.....	15.00	.....	.....	15.00	20.00
Oakfield, N. Y.	2.50	.....	.....	5.50	6.00	6.00	.....	5.50	.....	.....	.....	15.00	25.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	9.00	13.40	14.40	.....	15.40	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.00	10.00m	10.00m	13.00m	14.00m	.....	14.00	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail 35.00

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12–55.00¶	
Chicago District‡	180.00–210.00a	230.00–260.00a	280.00–330.00a
Columbus, Ohio	13.00	.....	.....
Detroit, Mich.	.15– .17†	.....	.24–.26†
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	11.00*	.....	.....
Graettinger, Iowa	.18– .20	.....	.....
Indianapolis, Ind.	.10– .12a	.....	.....
Los Angeles, Calif.	4x8x12–5.00*	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18– .20	.....	.....
Tiskilwa, Ill.	.16– .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	.....
Chicago District	14.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	.....
Ensley, Ala. ("Slagtex")	12.50	.....
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	.....
Milwaukee, Wis.	14.00	30.00
Mt. Pleasant, N. Y.	.....	14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	15.50	.....
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.50– 25.00
Rapid City, S. D.	18.00	30.00– 35.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60
Pasadena, Calif. (Stone Tile):	
3½x4x12, per 100	3.00
3½x6x12, per 100	4.00
3½x8x12, per 100	5.50
Tiskilwa, Ill.;	
8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened 200 mesh, $7.50 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton.
Granville, N. Y.—Red, green and black, $7.50 per ton.
Pen Argyl, Penn.—Blue grey, $7.50 per ton.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Oxford gray Buckingham	14.62	18.13	23.40	26.33	32.14	40.95
Bangor, Penn.—No. 1 clear	9.50–13.00	22.00	26.00	30.00	40.00	50.00
No. 1 ribbon	8.00– 9.25	18.00	22.00	26.00	36.00	46.00
Gen. mediums	8.50– 9.50	.....	.....	.....	.....	.....
No. 2 ribbon	6.00– 6.50	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—No. 1	8.50–11.25	.....	.....	.....	.....	.....
Medium	7.75– 9.00	.....	.....	.....	.....	.....
Artistique	.....	16.00	23.00	26.00	32.00	40.00
Fairhaven, Vt.—						
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	.....	.....	.....	.....
Pen Argyl, Penn.	10.50	16.00	23.00	27.00	37.00	46.00
Albion mediums	8.00–9.00	18.00	22.00	26.00	36.00	46.00
Cathedral gray	10.50–12.50	18.00	25.00	29.00	39.00	48.00
No. 1 ribbon	8.00–8.50	18.00	22.00	26.00	36.00	46.00
Textural	15.00	24.00	30.00	36.00	48.00	60.00
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Cement Building Tile

Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	14.00
8x 8x16, per 100	22.00
8x12x16, per 100	30.00
Columbus, Ohio:	
5x8x12, per 100	6.50
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.00

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)	.....	.....	.....	.60	.70	.90	1.20	.....	.....	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Longview, Wash.								Sewer pipe 40% off list; culvert—list									
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.								6 in. to 24 in., 18.00 per ton									
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.								12.00 per ton									
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	.70	1.55	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tacoma, Wash.	.15	.17	.22	.30	.40	.55	.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.90	.....	1.20	.....	.....	1.91	.....	2.60	3.60	4.35	5.93	6.83	7.70
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.76

(a) 24-in. lengths. (b) Reinforced (c) Delivered on job; 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

Sand-Lime Brick Production and Shipments in December

THE following data are compiled from reports received direct from 22 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is one more than those furnishing statistics for the November estimate published in the December 22, 1928, issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

As might be expected during December, there was considerably less activity shown by the sand-lime brick producers than in the previous months, due, of course, to a slack seasonal demand. Four plants reported no production at all, their plants being shut down for the usual winter repair period. Shipments, both rail and truck, show a comparable decrease over the figures for November. Unfilled orders are at a minimum, but stocks on hand show an increase over the last month's figures. There are no changes in prices of any note since the November figures were published.

The following are average prices quoted for sand-lime brick in December:

Average Prices for December

Shipping Point	Plant Price	Delivered
Atlantic City, N. J.	$11.50	.....
Buffalo, N. Y.	12.25	16.50
Dayton, Ohio	12.50	15.50
Detroit, Mich.	.....	15.50
Detroit, Mich.	.....	15.50@16.00
Detroit, Mich.	13.00@14.00	15.50@16.00
Flint, Mich.	.....	.....
Grand Rapids, Mich.	.....	.....
Jackson, Mich.	12.25	.....
Madison, Wis.	12.50	14.00
Milwaukee, Wis.	10.50	13.00
Minneapolis, Minn.	10.00	12.75
Mishawaka, Ind.	11.00	.....
Pontiac, Mich.	12.00	14.00
Rochester, N. Y.	.....	19.75
Saginaw, Mich.	12.00	.....
Sebewaing, Mich.	.....	.....
Sioux Falls, S. D.	.....	.....
Syracuse, N. Y.	15.00@16.00	20.00
Toronto, Canada	12.50	15.00
Toronto, Canada	12.60	15.00
Winchester, Mass.	.....	.....

The following statistics are compiled from data received direct from 22 producers of sand-lime brick in the United States and Canada:

Statistics for November and December

	*November	†December
Production	18,164,100	13,013,500
Shipments (rail)	4,588,300	3,527,300
Shipments (truck)	12,942,400	8,681,600
Stocks	11,578,800	13,727,300
Unfilled orders	10,447,000	9,509,000

*21 plants reporting.
†Incomplete, nine plants not reporting unfilled orders.

Notes from Producers

The Jackson Brick Co., Jackson, Mich., is furnishing brick for the new addition to the Frost Gear Co.'s plant.

Sand-Lime Brick Association Annual Convention

THE twenty-fifth annual convention of the Sand-Lime Brick Association will be held at the Hotel Mayflower Washington, D. C., February 5, 6 and 7, 1929. The regular convention dinner will be held at the Hotel Mayflower, Tuesday evening, February 5, at 7 P. M. and is open to members and their guests. Arrangements will also be made for the entertainment of ladies attending the meeting. Following is the complete convention program:

TUESDAY, FEBRUARY 5

10:30 Morning Session, North Room, Mayflower Hotel.
Enrollment.
Payment of Dues.
Introducing New Members.

2:00 Afternoon Session, North Room.
President's Message.
Report of Secretary.
Communications.
Report of Treasurer.
Report of Standing Committees.
Appointment of Committees, Audit, Nomination, Resolutions.
"Depreciation Study of the Bureau of Internal Revenue in Co-operation with National Organizations of Industry"—John Alden Grimes, Bureau of Internal Revenue, Washington, D. C.
"The Manufacture of Building Tile of Vibrated Concrete and Hardened with Steam"—W. H. Crume, The Crume Brick Co., Dayton, Ohio.
Explosives—Pictures and Talk Showing Their Use—du Pont, Wilmington, Del.
"Lime as Used in Our Products"—D. M. Gray, Louisville Cement Co., Louisville, Ky.
"A Romance in the Building Industry"—I. M. Porter, Structural Gypsum Corp., Linden, N. J.

7:00 Evening Session, Chinese Room, Mayflower Hotel.
Musical Program—Ruth L. Morgan.
Speaker—Hon. Frank Crowther, Representative, 30th District of New York.

WEDNESDAY, FEBRUARY 6

10:00 Bureau of Standards, Room 353, Industrial Building.
Address of Welcome—Dr. George K. Burgess, Director, Bureau of Standards.
"Fire Resistance Tests with Particular Reference to Wall Construction"—S. H. Ingberg, Bureau of Standards, Fire Resistance Section, Washington, D. C.
"Fire Test of a Sand-Lime Brick Wall Under Load"—Will be started about 10:00 A. M., Bureau of Standards, Washington, D. C.
"Commercial Utilization of Farm Wastes"—W. E. Emley, Chief, Organic and Fibrous Materials Division, Bureau of Standards, Washington, D. C.
"Sand-Lime Brick Development in Florida"—C. W. Caldwell, Lakeland Silex Brick Co., Inc., Lakeland, Fla.
"Lime as Produced for the Canadian Market"—Bruce C. Matson, Beachville White Lime Co., Beachville, Ont.
"The Manufacturer's Interest in Legislation"—James A. Emery, General Counsel, National Association of Manufacturers, Washington, D. C.
"Tests of Sand-Lime Brick"—I. A. Murray, Bureau of Standards, Washington, D. C.

1:15 Luncheon, Bureau of Standards.

2:00 Afternoon Session, Bureau of Standards, Room 353, Industrial Building.
"Manufacture of Silica Brick on a Rotary Press"—L. A. Haigh, W. A. Riddell Co., Bucyrus, Ohio.
"Problems of the Sand-Lime Brick Industry"—Wm. F. C. Dall, Northern Indian Brick Co., Mishawaka, Ind.
"Activities of Committee C-3 on Brick, A.S.T.M."—W. H. Crume, The Crume Brick Co., Dayton, Ohio.
"City Building Codes"—J. Morley Zander, Saginaw Brick Co., Saginaw, Mich.
"Address on the Progress of Standardization"—I. J. Fairchild, Department of Commerce, Washington, D. C.

THURSDAY, FEBRUARY 7

8:15 Convention Breakfast—at Expense of the Association—North Room, Mayflower Hotel.
Discussion—Sales and Advertising, H. H. Gould, Belt Line Brick Co., Minneapolis, Minn.

10:00 Round Table—Members only—not reported, bring your troubles along.
Cost of Brick—Bring figures for year 1928.
Unfinished Business.
New Business.
Reports of Committees.
Election of Officers, etc.

Minneapolis Sand-Lime Brick Producer Starts Large Advertising Campaign

THE Belt Line Brick Co., Minneapolis, Minn., has started an advertising campaign to familiarize architects, contractors, dealers and others in the northwest with the uses and advantages of sand-lime brick. The company plans to send out circulars to those who would be interested, and these will be mailed within the next few weeks, so that the campaign will be well under way before the spring building season opens. The first shot of the campaign is a circular entitled "A Novel Treatment of Outside Walls." In it are described methods of using sand-lime brick in home construction and also for large public buildings. It is well illustrated.

The Belt Line Brick Co. is doing a commendable thing in "selling" sand-lime brick to the public. While it is certain that the company will benefit directly from the campaign, it is equally certain that the industry as a whole will be aided. Now is the time, it seems, for producers in other parts of the country to follow the lead of the Minneapolis company and teach their own communities the advantages of sand-lime brick through the medium of sound advertising.

New Machinery and Equipment

Improved Welding Gloves

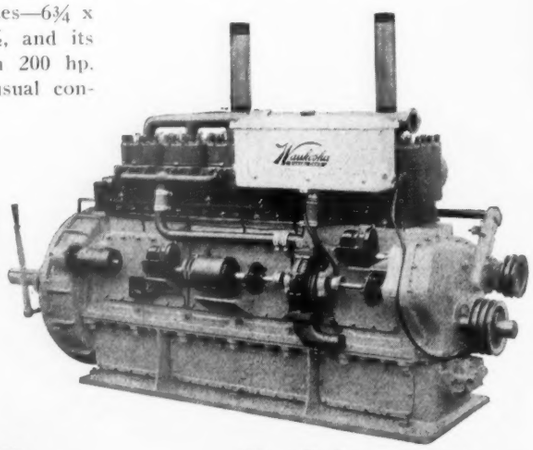
OXWELD ACETYLENE CO., New York City, has added to its line of accessories for oxy-acetylene welding and cutting, gauntlet gloves of a soft and pliable suede leather, specially treated to prevent heat from affecting it, to supersede the Oxweld horsehide gloves formerly supplied.

A leather strip on the thumb seam and a semi-circular reinforcement on the inside seam, adjoining the palm, reinforce the glove. The left glove has a leather reinforcement, covering the entire back between the fingers and gauntlet, for protecting the back of the left hand during cutting operations. A close fitting gauntlet adequately protects the arms. The reinforcements make them very durable. These gloves will not stiffen or shrivel from the application of heat or from soaking in water, the company claims.

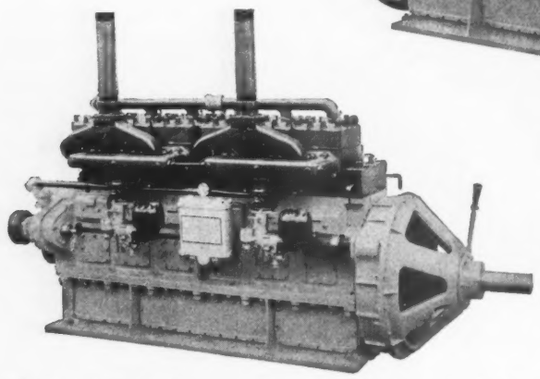
New Six-Cylinder Gas Engine Shown at the Road Show

THE first public showing of the new "Great Six" engine of the Waukesha Motor Co., Waukesha, Wis., occurred at the Road Show in Cleveland. The "Great Six" engine is built in three sizes—6¾ x 8½, 7¼ x 8½, and 7¾ x 8½, and its horsepower ratings range from 200 hp. upwards. In addition to the usual construction features embodied in Waukesha "Ricardo Head" power units, the "Great Six" has a duplex oiling system which is designed to function under all conditions of operation, tilted or otherwise, and is claimed to be the most complete and advanced to be found in any engine today, according to the makers.

Of particular interest to industrial power users is the fact that the "Great Six" on account of its range of sizes invades the field heretofore dominated by engines of the Diesel or semi-Diesel type such as the main power unit for dredges, emergency electric power units, large excavating equipment, etc. Particularly where operations are intermittent, it is claimed that when all factors of cost are considered, including depreciation, amortization, etc., then on account of their smaller first cost and other advantages, the "Great Six" engines will be found economical and deserve the consideration of operators for all duties up to 300 hp.



Six-cylinder gas motor recently announced at the Road Show



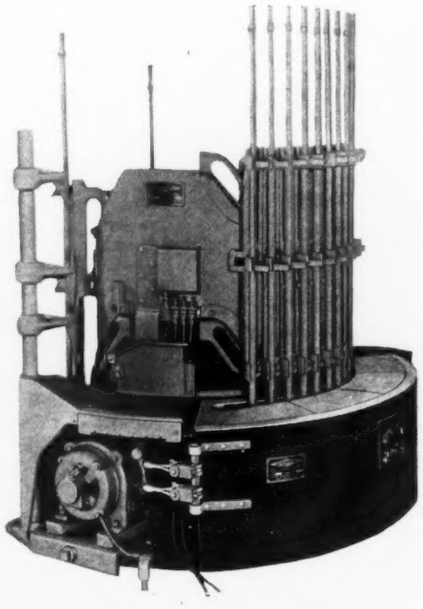
New six-cylinder gasoline engine particularly adapted to installations where operations are intermittant and first cost important

Automatic Heat Treating Machine for Drill Steel

THE Gilman Manufacturing Company, of East Boston, Mass., has recently placed on the market an electric automatic heat treating machine for hardening and tempering automatically, by mechanical and electrical means, the bit end of rock drill steel as used in mining, quarrying and on contract drilling.

The electric furnace in which the drill steels are heated is of the "Globar" type, consisting of a heating chamber, rectangular in section, with a slot extending lengthwise in its top cover, through which the drill steels, suspended on carriers from the circular track of the machine, are inserted. When in the heating chamber the bit end of the steel is heated by radiant heat from the Globars to the exact hardening temperature, when it is automatically removed from the furnace, hardened by quenching in a fountain of cold water and then tempered, after which it is automatically ejected from the machine ready for use. Thus the whole process is made entirely automatic and the human element in the hardening and tempering of the drill steel is completely eliminated.

The manufacturers claim that the automatic control mechanism insures the temperature of the drill bit being held within five degrees, plus or minus, from its exact critical range temperature at the instant the drill steel is removed from the furnace for quenching.



Automatic heat treating furnace for drill steel

The electric current requirements of the machine are 32 K.W. when heat treating drill bits at the rate of 100 per hour, the manufacturers claim.

It is also claimed that great economies are effected by the use of this machine, by removing entirely the personal equation from the operation. At many properties the use of the Gilman automatic heat treating machine has resulted in a decrease of from one-third to one-half in the quantity of drill steels required to perform a given amount of work as compared to previous methods, according to the company.

New pump with a vertical motor

New Line of Sump Pumps

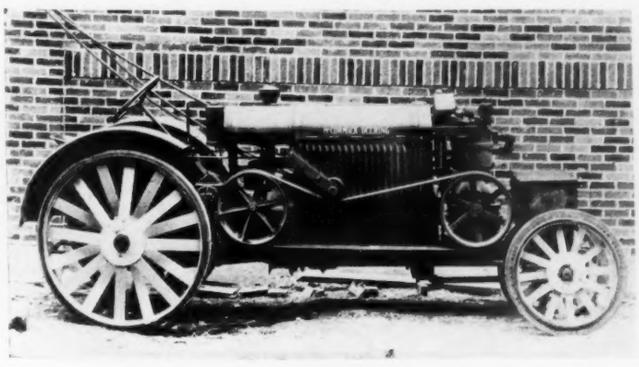
THE American Well Works has just announced a new and improved line of sump pumps which, it is claimed, have many advantages over the old type. The units of this new line, besides being self-controlled, are claimed to be highly efficient and are sturdily built to meet the unusual in service and to stand up under abuse.

The "American" type M.M.D. sump pump differs from other motor driven pumps in that it employs a hollow shaft motor in place of the old solid shaft type. This construction makes possible a simple compact pump. By this construction, flexible couplings and thrust bearings are eliminated. The pump shaft extends up through the motor shaft, hence both motor and pump use the same thrust bearing which is mounted in the upper end of the motor making adjustments very easy. The elimination of high motor supports is made possible as the pump supporting pipe is bolted through to a cast iron plate that in turn bolts to the motor. Regardless of distortion in the pit cover, the alignment of the pump and motor is not affected, it is stated.

The pump shaft bearings consist of removable bushings. The pit plate is made of plate steel and is furnished either round or square. Pump may be had for all standard settings up to 17 ft. in either single or duplex units. All units are furnished complete with a float control switch, oiling device and motor.

New 4-Wheel Air Compressor

A SELF-PROPELLING four-wheel air compressor, capable of handling heavy loads behind itself while moving about on the job under its own power, is announced by the Pontiac Tractor Co., Pontiac, Mich. The compressor is a "Quincy Type W-4" of 124 cu. ft. displacement, having a separate radiator with pump-driven circulation. It is claimed that this holds the temperature of the air coming from the compressor 60 to 70 deg. lower than the temperature of air from compressors which are cooled from the motive-power radiator. The compressor has a three-bearing crank shaft and force-feed lubrication. This unit is controlled by a Penn unloader with hand unloader attachment. The compressor with the air tank and tool box are mounted on a frame which attaches to either the McCormick-Deering or Fordson tractors. Power is taken from the tractor to drive the compressor through the power take-off pulley, which has a clutch allowing it to be thrown out or into gear at will. The "ahead" drive of the belt brings the tightener into correct relation with the belt.



New four-wheel self-propelling air compressor

Arthur E. Blackwood Elected President of Sullivan Machinery Co.

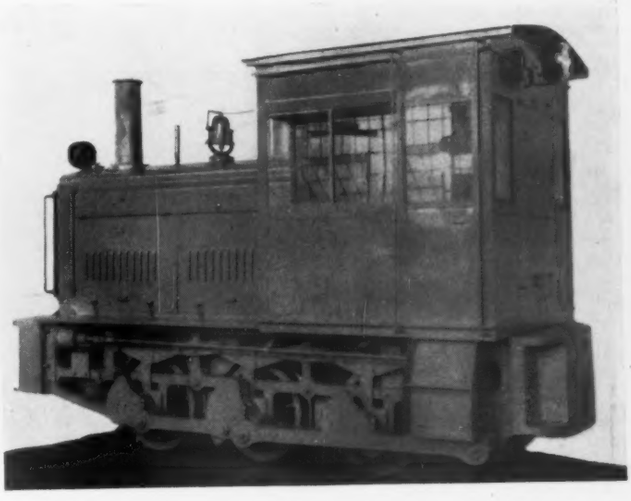
AT a special meeting of the board of directors of the Sullivan Machinery Co. held recently at its Boston, Mass., office, Arthur E. Blackwood, of Chicago, was unanimously elected president of the company, succeeding the late Frederick K. Copeland.

Mr. Blackwood has been with the Sullivan Machinery Co. for the past 32 years. He came to the company shortly after graduating at Toronto University as a mechanical and electrical engineer, and later became manager of its eastern sales department with headquarters in New York, which office he held for 23 years. He was then elected a director and first vice-president in charge of finances, and moved to the company's head office at Chicago, where he continued in close relation with Mr. Copeland until the latter's death in November of this year.

Six-Wheel Locomotive Adapted for Use on Uneven Trackage

A NEW 20-ton, six-wheel, gear and side drive locomotive for industrial hauling and switching has been announced by the Geo. D. Whitcomb Co. of Rochelle, Ill. The company claims the advantage gained by the use of this six-wheel locomotive is that it gives a very even distribution of weight over the three wheels and can be operated in industrial plants where the tracks are not in perfect condition or are laid on soft ground.

The new locomotive is full gear driven, transmitting the power to the wheels through side rods. It is equipped with standard air brake equipment. It is suitable for use in industrial plants for switching and on railroads for short main line hauls. It is also designed for quarries, cement plants, steel mills, lumber tracks and other places where ground conditions are soft or rugged and there is an uneven track.



Six-wheel locomotive suitable for quarry or gravel pit use

News of All the Industry

Incorporations

Columbus Sand and Gravel Co., Middletown, Ohio, $30,000.

Robinson Sand and Gravel Co., Brunswick, N. Y., $20,000. F. C. Claessens, Troy, N. Y.

Donara Sand and Gravel Corporation, Mineola, N. Y., $5,000. Fay and Gibson, Mineola.

Mabie Cement Poducts, Inc., Livingston, N. Y., $100,000. Fraser and Trimble, Montclair, N. Y.

High Ridge Gravel Corporation, Grand Rapids, Mich., $5,000. Sand and gravel.

Valley Sand and Gravel Co., Beachwood, Ohio. 100 shares, no par value. John D. Schwartz, Arthur F. Brown and Alfred J. Yericke.

Hy-Rock Products Co., Evansville, Ind., $30,000. To quarry rock and other minerals. Arthur H. Mann, Henry G. Roetzel and Edgar Traylor.

Western Hills Sand and Gravel Co., Cleves, Ohio. 250 shares, no par value. Agnes Georgi, Frank J. Ulrich and Edward B. Ulrich.

Freestone Sand and Gravel Co., Johnson City, Tenn., increasing capital stock from $10,000 to $30,000.

Milwaukee Building Material Dealers Co-operative Corporation, Milwaukee, Wis., 10,000 shares at $10 each. Wilbur A. Margraff.

Atlantic Cement Products Co., Hicksville, N. Y., 3500 shares preferred, $100 each, and 10,000 shares common of no par value.

Marlbrook Lime Co., Inc., Roanoke, Va., $100,000. To quarry, manufacture and sell limestone. J. A. Jamison, Colonial National Bank Bldg., Roanoke, Va.

Nucarth Stone Co., Carthage, Mo. To quarry and manufacture marble and pulverized stone for general building purposes. E. N. Wetzel, manager, and J. A. Packard, superintendent.

Charlotte Stone Co., Charlotte, N. C., $75,000. To quarry and prepare stone for marketing. George H. Moore, Vaughan Hawkins, R. H. Proctor and A. L. Simpson.

American Cement Products Co., 2425 N. Crawford Ave., Chicago, Ill., $30,000. To manufacture cement products. J. R. Kennedy, F. W. Hartman and A. R. Westergaard.

Piedmont Quarries, Inc., Winston-Salem, N. C. Formed by merger of Salem Quarries, Inc., and Piedmont Quarries Co.; authorized capital, $125,000. The new company are planning on extensive improvements.

Van Camp Sand and Gravel Co., Cincinnati, Ohio. Capitalization, $600,000. Plant to be at South Lebanon, Ohio, and offices in Palace Theater Building. John V. Campbell, Charles H. Elston and Pauline E. Smith.

Carolina Marble Products, Inc., Andrews, N. C. To mine and quarry stone and to manufacture same. 300 shares of no par value, all subscribed for by Catherine G. Martin, J. C. Christie and J. A. Martin, all of Andrews, N. C.

Boston Sand and Gravel Co., Boston, Mass., $2,500,000; 50,000 preferred shares, $50 each; 100 shares common, no par value. Paul P. Bird, 88 Broad St., Boston, treasurer, and Perley F. Ayer. New incorporators are merely taking over assets of the older company.

Maritime Portland Cement Co., Ltd., Brookville, N. B., Canada, $1,000,000; 7500 shares of 7% cumulative redeemable preferred stock and 2000 shares of common of no par value. G. E. Chester Gandy, R. D. Paterson, Harry E. Reardon, T. P. Regan and Stanley G. Olive, all of St. John, N. B.

Quarries

Owen Slider Co., Littletown, W. Va., filed voluntary petition in bankruptcy. Owen Slider, owner, lists assets at $51,000 and liabilities at $20,000.

William Smith Co., New Corydon, Ind., is moving machinery to a new quarry which was recently purchased from C. Anderson.

Alabama Lime and Stone Corporation, Birmingham, Ala., completed a crushed-stone plant at Calera, Ala.

Virginia Greenstone Corporation, Lynchburg, Va., expects to place orders for machinery for production of dimension stone early this year, according to late reports.

Mid-West Crushed Stone Co., Greencastle, Ind., is reported as planning on installing additional equipment to pulverize limestone and to make a mason's cement. This company also has plants at Spencer and Ridgeville, Ind.

Hy-Rock Co., Evansville, Ind., which was recently incorporated, has purchased the holdings of the old Marengo Crushed Stone Co. at Marengo, Ind. Offices will be maintained in Evansville and the company will operate the old Marengo quarries. E. Traylor will be the president of the concern; H. G. Roetzel, vice-president, and A. H. Mann, secretary and treasurer. The Marengo quarries are located near the Milltown quarries. Mr. Mann formerly was manager of an electric railway line at Lima, Peru, South America, and Mr. Roetzel formerly operated coal mines in Pike county,

Douds Stone Co., Douds, Iowa, has filed articles of incorporation in the recorder's office at Keosauqua, Iowa, and is operating the stone quarry located one-half mile east of that place. The officers of the corporation are C. V. Ray of Des Moines, president and treasurer; J. D. Kent of Des Moines, secretary, and H. E. Millen of Douds, secretary. Arrangements are being made to completely electrify the equipment used at the quarry and to enlarge the capacity for output. A high line will be erected by the Iowa Electric Co. running from primary road No. 1 to the quarry, as soon as weather conditions permit, according to *Ottumwa* (Iowa) *Courier*.

Sand and Gravel

Von der Hellen Gravel Co., Medford, Ore., will reopen its pits above Gold Hill on the Rogue river.

Coastal Construction Co. expects to spend $150,000 in the establishing of a dredge near Handsboro, Miss.

Consolidated Sand and Gravel, Ltd., Toronto, Ont., announces the removal of headquarters office from the Redford Bldg. to 402 Harbor Bldg., Toronto.

Oil City Sand and Gravel Co., Oil City, Penn., has applied to the federal government for a permit to construct a sand and gravel unloading dock at Oil City.

Smoot Sand and Gravel Co., 3020 K St., N.W., Washington, D. C., was awarded a contract involving $90,065 by the U. S. Engineer's office. The contract calls for sea-wall construction and rip-rap work along the Potomac and Anacostia rivers.

Cape Sand and Gravel Co., Cape Girardeau, Mo., according to the *Cape Girardeau* (Mo.) *Missourian*, shipped during 1928 approximately 40,000 tons of sand, most of which went for highway construction, and this tonnage just about equals the 1927 production.

Arkansas Sand and Material Co. is establishing a sand and gravel plant on the Arkansas river near Pine Bluff, Ark. Frank R. Allen is engineer for the company and Marvyn Jones of St. Louis, Mo., is president. The first barge to be placed in service by the company is reported to have arrived at Pine Bluff early in January.

Ideal Sand and Gravel Co., Mason City, Iowa, is reported by a Des Moines, Iowa, newspaper as having doubled its business in 1928 as compared to 1927. The past year's business also proved 15% better than any previous year. The company also employed 20% more men as well as adding considerable screening capacity to its plant.

St. Louis Rock, Sand and Gravel Co., with headquarters in St. Louis, Mo., is reported to be making a preliminary survey on property leased from Golconda, Ill., people and intend to start opening up a new quarry at that place. The site chosen for the proposed quarry is a high ledge paralleling the river and is convenient for river transportation.

Gypsum

Pacific Coast Cement Co., Seattle, Wash., entertained the members of the Western Public Contractors Association at its new plant, January 3.

Atlas Portland Cement Co. held a general sales conference for its southern territory representatives the first week in January, at Birmingham, Ala.

Huron Portland Cement Co., Alpena, Mich., has approved plans for new unit, including kiln, mechanical dryer and auxiliary equipment, with storage and distributing facilities, to cost over $150,000.

Michigan State Cement Plant, Chelsea, Mich., still owes the state $675,000. This is a decrease of $300,000 under the deficiency last January. Auditor-General Fuller said this cut in the deficit does not indicate the plant has earned money during the last 12 months, as it is a record only of cash transactions.

Olympia Portland Cement Co., Bellingham, Wash., according to local newspapers, produced about 800,000 bbl. in 1928, or about 95% of its capacity. An active 1929 is anticipated. The company plans to begin operating its new quarry at Limestone next March or April. Millions of tons of limestone are available there and modern machinery will be employed in its extraction.

Cement Products

Yant Construction Co., Omaha, Neb., has started a cement block plant at 45th and Izard Sts.

Cast Stone Products Co., Los Angeles, Calif., has filed notice of application for voluntary dissolution of the corporation.

Collins Concrete Pipe Co., Portland, Ore., was awarded the contract for furnishing 14 miles of pipe for the Yakima irrigation project in eastern Washington.

Shearman Concrete Pipe Co., Knoxville, Tenn., which was sold two years ago, has been again acquired by A. N. Shearman and a new company will be organized to operate its plants at Knoxville, Chattanooga, Tenn., Atlanta, Ga., Jacksonville and Tampa, Fla.

Botzum Brothers Co., 100 N. High St., Akron, Ohio, has doubled the capacity of its ready-mixed concrete plant by the addition of two Barrymore concrete mixers and open-top truck bodies with concrete mixers. Botzum Brothers Co. have the exclusive rights for Akron for using this type of truck mixers.

Gypsum

National Gypsum Co., Buffalo, N. Y., held their annual sales convention at the Hotel Statler, Buffalo, N. Y., early in January. Fifty salesmen of the company attended.

United States Gypsum Co., Chicago, Ill., is reported to have taken over mines and plant at Cheticamp, Nova Scotia, Canada, and a staff of 250 men are now employed in rushing work on the new 500-ft. all-metal warehouse and crushing plant that is expected to have an annual output of 300,000 tons.

Lime

United States Gypsum Co. will open a new limestone quarry near Cordova, Ill., according to reports.

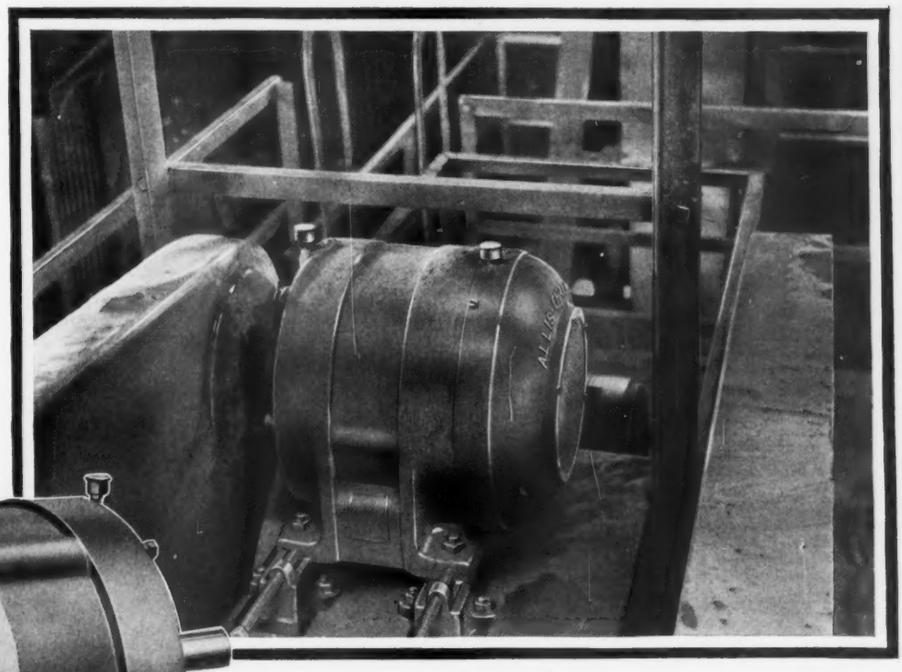
Agricultural Limestone

Limestone Fertilizer Co., Whitaker Bldg., Davenport, Iowa, is said to be planning on building a new $500,000 plant at Burlington, Iowa.

Santa Fe Railway's agstone special, which was run through to Ottumwa, Kan., last July, gave impetus to the use of limestone in Franklin county. According to reports, 3771 tons of agstone was spread over 1600 acres in that section from January 1, 1927, to November 30, 1928, but that more than 1000 tons of the above total was used since July, 1928.

Spring River Lime Association, Hoberg, Mo., received 27 carloads of limestone and distributed this material to the farmers in the association. A survey made by the *Aurora* (Mo.) *Advertiser* shows that 200 farmers out of a total of 600 in Lawrence county, Mo., used agstone for the first time during 1928 and a total of 87 carloads were shipped into the county.

Dirt cannot enter



Allis-Chalmers Type ARZ, totally enclosed fan-cooled motor driving sand elevator in a large steel foundry.

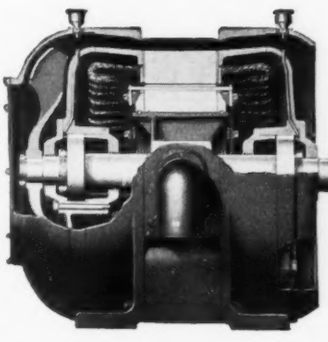
In spite of the accumulation of dirt on and around this Allis-Chalmers motor the inside is as clean as the day it left the factory.

-this totally enclosed fan-cooled motor

This Allis-Chalmers totally enclosed fan cooled motor is protected permanently against damage under such operating conditions. The stator windings and rotor, and all parts subject to destruction, are sealed against the entrance of dirt. An open type motor in such a location is not the economical selection in view of the availability of the totally enclosed fan-cooled type.

ALLIS-CHALMERS MFG. COMPANY, MILWAUKEE, WIS.

District Offices in all Principal Cities



ALLIS-CHALMERS

Totally Enclosed Fan-cooled **MOTORS**

Silica Sand

Gem Stone Silica Co., Wenatchee, Wash., plans proceeding rapidly for the construction of several new units to cost approximately $40,000 and will consist of additions to their present plant of storage bins, crushing machinery and seasoning kilns, these latter to be used for curing cast concrete products, which is one phase of this company's operation.

Miscellaneous Rock Products

Coronet Phosphate Co., 99 John St., New York City, and Pembroke, Fla., according to reports, will construct a new washer near Mulberry, Fla.

Attapulgus Clay Co., Bainbridge, Ga., acquired 3500 acres of land adjoining its present holdings. C. M. Shaeffer, general manager, according to the Savannah (Ga.) News, shipped 350 cars each month during 1928.

National Lead Co., St. Louis, Mo., has leased through its subsidiary, the National Pigment and Chemical Co., a barytes deposit near El Portal, Calif. For development of this property a new corporation was formed called the National Pigment Co., with Evans McCarty, president; A. S. Moses and J. B. Keister, vice-presidents, and R. P. Prentys, secretary.

Personals

Charles Boettcher II has been elected a director of the Denver National Bank, Denver, Colo.

Kenneth R. Ames has been appointed sales manager of the Cement Products Co., East River St., Davenport, Iowa.

A. Lundteigen has been promoted to be vice-president in charge of operation of the Ash Grove Lime and Portland Cement Co., Kansas City, Mo.

Lee H. Tucker has been appointed special sales representative in the Toledo, Ohio, district, including 15 counties, for the Peerless-Egyptian Cement Co., Detroit, Mich.

Arthur Hillegas, formerly of Hudson, N. Y., sales manager of the International Cement Co. at Buenos Ayres, Argentina, has been elected a director of the company, according to Hudson newspaper reports.

A. M. Oliver, for six years in the advertising department of the Goodyear Tire & Rubber Co. at Akron, Ohio, has resigned to become advertising manager of the Pangborn Corp., Hagerstown, Md., manufacturers of sand blast and dust collecting machinery. Mr. Oliver's connection with the Goodyear company covered a period of more than thirteen years, seven years having been spent in the sales department as special technical representative in the Coeur d'Alene and Joplin mining districts, and later in charge of the Goodyear plant analysis division of the mechanical rubber goods sales department.

A. M. Oliver

Henry Koch, president of the Koch Sand and Gravel Co., Evansville, Ind., returned from Detroit, Mich., where he attended a banquet of the Graham-Dodge Corporation, who are reported to be building a $2,000,000 plant at Evansville.

George I. Purinell, general sales manager, and **David E. Washburn**, chemist for the American Lime and Stone Co. at Bellefonte, Penn., were hosts at a hunting party during December at the Sycamore Island Camp, at Snow Shoe Intersection. The group succeeded in getting two deer and also shot at two large black bears, but failed to bring down either of them. Those who were included in the party were H. S. Dettlinger, Sr., H. S. Dettlinger, Jr., Edward and Clayton Dettlinger, Albert Young and Michael Gelbrect, all of Pittsburgh.

Generoso Pope, president of the Colonial Sand and Gravel Co., has been reported as having purchased the Italian newspaper *Il Progresso Italo-Americano* for $2,053,000. This newspaper is one of the largest in the United States and Mr. Pope does not propose to effect any changes in its policy, which has been in sympathy with the Fascist regime, according to the *New Orleans* (La.) *Times-Picayune*.

Obituaries

Charles A. Daniel, president of the Quaker City Rubber Co., Philadelphia, Penn., died December 24.

Charles J. Kirch, president of the American Cement Machine Co., and vice-president and secretary of the Weber-Kirch Co., died at St. Joseph's hospital, Kahoka, Mo., December 12, at the age of 64 years.

Manufacturers

Youngstown Sheet & Tube Co., Youngstown, Ohio, announces the appointment of W. B. Gillies as assistant to Wm. C. Reilly, vice-president in charge of operations. Mr. Gillies was formerly district manager of the company's plants at Chicago.

American Manganese Steel Co., Chicago, Ill., has installed at the New Cornelia Copper Co. plant, Ajo, Arizona, what is claimed to be one of the largest, if not the largest, pan conveyor-feeder in the world. The conveyor at a speed of 10 ft. per minute will feed ore to the primary crusher at a rate of 8000 tons per 10-hr. day. The Amsco company trade bulletin of January 10, 1929, describes the complete installation.

Deemer Steel Casting Co., New Castle, Del., announce the appointment of Wm. W. Swayze, formerly manager of the American Manganese Steel Co.'s plant at New Castle, as superintendent of its plant. Shortly after the first of January the Deemer company will be equipped to manufacture manganese steel castings. Its production of carbon and various alloy steel castings will continue as heretofore.

Foote Bros. Gear & Machine Co., Chicago, Ill., to better serve its customers in eastern territory, has recently established a New York branch office to have control of all territory in the New England States, New York, as far west as Rochester and the northern half of New Jersey. The office is in direct charge of E. A. Phillips, who will have his headquarters in the Woolworth Bldg., New York City.

General Refractories Co., Philadelphia, Penn., has opened a new district sales office at Boston, Mass., located in Room 509, Marshall Bldg., 40 Central St. The office will be in charge of Nelson W. Bowman, formerly of the New York office. The company also announces that their Detroit office has changed its address to 6-230 General Motors building. This office will continue in charge of J. L. Graham.

Yale and Towne Manufacturing Co., Stamford, Conn., recently dedicated a new service and recreational building for the benefit of its employees. Funds for the erection and care of this building were provided through a special bequest in the wall of the late chairman of the board, Henry R. Towne. The new building houses a hospital, dental clinic, industrial relations bureau, auditorium with a seating capacity of 400, library, bowling alleys, pool tables and every convenience for the service and entertainment of the employees.

Magnetic Manufacturing Co., Milwaukee, Wis., manufacturers of "High Duty" magnetic separators, clutches, etc., announces that its products will now bear the trade name "Stearns" in addition to the former trade name "High Duty." This action was prompted by the need for a more specific identification of its products than that of the general term "High Duty" used in the past, and the new designation is derived from the names of company officers, R. H. Stearns, president and treasurer, and R. N. Stearns, secretary.

Armstrong Mfg. Co., Waterloo, Iowa, has established a branch office and warehouse at 1506 Mayflower St., Harrisburg, Penn. A new building has been erected with excellent loading and unloading facilities, and a complete line of Armstrong blast hole drills and other products of the company will be carried. F. J. Schermer, formerly manager of the company's branch at Scottsville, Ky., will be manager of the new branch. He will be assisted by H. C. Neely, who has been connected with the company for a number of years in the Kentucky and Florida territories.

International Combustion Engineering Corp., New York City, announces that its subsidiary, F. J. Lewis Manufacturing Co., producers of coal tar products, will henceforth be known as the International Combustion Tar & Chemical Corp., with offices at 200 Madison Ave., New York, and 2500 South Robey St., Chicago. The new company will continue and extend the activities of the F. J. Lewis Manufacturing Co., and the products of the new organization will be sold under the brand name of "IN-CE-CO."

Wagner Electric Corp., St. Louis, Mo., announce the addition of R. L. Matthews to the sales force of their Chicago branch office. Mr. Matthews is a graduate of Purdue University, where he studied electrical engineering. He has been active in the electrical field, having been connected with such organizations as the Michigan Bell Telephone Co., Armstrong Cork and Insulation Co. and the National Electric Products Corp. The company also announces the addition of N. H. Spencer, whose experience in the electrical field covers some 20 years, to their Dallas, Texas, sales force.

Lincoln Electric Co., Cleveland, Ohio, has recently released a new educational motion picture entitled "Modern Manufacturing with a 'Stable-Arc' Welder," portraying the advantages of arc welding and the widespread possibilities of its application. The new film traces the history of the commercial use of welding and compares the physical characteristics and costs of cast iron and rolled steel, also of cast iron, riveted steel and arc welded construction, etc. The motion picture is contained in three reels of standard size film. It is also available in 16-mm. film size, and is offered gratis for showing upon application to the company.

General Electric Co., Schenectady, N. Y., announces that H. L. R. Emmet, who has been with the company since 1912, and production manager of the Schenectady works since 1922, has been appointed manager of the Erie, Penn., works, succeeding Matthew Griswold. J. E. Brobst, who has been with the company since 1903, since 1920 as engineer of the industrial control engineering department at Schenectady, has been named manager of the Bloomfield, N. J., plant, succeeding C. D. Knight. He will continue to act in the capacity of engineer of the industrial control department, having general supervision over the engineering departments at both Schenectady and Bloomfield.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Rock Crushers. Bulletin No. 100, completely illustrated and giving specifications and other data on New Holland rock crushers. NEW HOLLAND MACHINE CO., New Holland, Penn.

Snow Fighting with Crawler Tractors. Broadside "Open Roads at Low Cost," showing clearing of roads and describing use of patented, corrugated track shoes with ground gripping surface, specially designed detachable snow grouters, and snow plows on Trackson-McCormick-Deering crawler tractors. TRACKSON CO., Milwaukee, Wis.

Two Cubic Yard Electric Shovel. A 20-page illustrated bulletin describing the company's 50-B shovel for quarries, mines, cement plant, gravel pits and similar work. Picture shows details of construction as well as example of shovel at work. Diagrams and specifications are included. BUCYRUS-ERIE CO., Erie, Penn.

Jaw Crushers. A 25-page bulletin (No. 2099) on BULLDOG jaw crushers, exceptionally well illustrated with photographs, drawings and tables helpful in the selection of the proper size crusher. Of particular interest is description of the safety device for protecting crushers from injury due to overloading, obstructions in the discharge opening, etc. TRAYLOR ENGINEERING AND MANUFACTURING CO., Allentown, Penn.

Modern Equipment. A group of attractively illustrated bulletins bound in one cover and covering the following subjects: centrifugal pumps, diaphragm pumps, power units ranging from 2 hp. to 96 hp., and piston type pumps of various capacities from 7 to 82 gallons per minute. The bulletins include operating data on the various units, specifications, suggested uses, and illustrations of equipment and installations. O. E. SZEKELY CORP., Holland, Mich.

Large Polyphase Induction Motors. Bulletin **No. 1087-F** containing 16 pages describing the company's line of large induction motors, illustrated with pictures of the motors and of several installations. **Polyphase Induction Motors, Types AR and ARY.** Bulletin **No. 1118-E** describing and illustrating the company's line of polyphase induction motors with either sleeve or tapered roller bearings. **Texrope Drives.** Illustrated 16-page bulletin describing typical drive installations on various machinery, including crushers, fans and similar equipment. ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.

G. E. Bulletins.—Constant-Speed Direct-Current Motors. Bulletin **GEA-61B** describing and illustrating constant-speed direct-current motors ranging in size from 3 to 200 hp., and either shunt- or compound-wound. **Magnetic Reversing Switch.** Bulletin **GEA-844A** describing and illustrating the across-the-line type of magnetic reversing switch for single-phase, two-phase and three-phase motors providing temperature overloading protection and under-voltage protection. **Constant-Potential Arc-Welding Sets.** Bulletin **GEA-569B** giving data on and illustrating the company's line of constant-potential arc-welding sets particularly adapted to automatic welding. **Gas-Engine-Driven Arc Welder.** Illustrated bulletin **GEA-881A** of gas-engine-driven arc welder with current ranges of from 60 to 300 amperes.